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REVIEW OF THE STATE OF WORLD FISHERY RESOURCES:

MARINE FISHERIES

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REVIEW OF THE STATE OF WORLD FISHERY RESOURCES:

MARINE FISHERIES

by

Marine Resources Service
Fishery Resources Division
Fisheries Department

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
ROME, 1995

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PREPARATION OF THIS DOCUMENT

Every two years the state of the world fish stocks and aquaculture are reviewed by the Fishery Resources Division for FAO's Committee on Fisheries (COFI). Whereas the Review formerly included all capture fisheries and aquaculture, for the Twentieth Session of COFI, March 1993, it was necessary to separate it into two parts: the world's marine resources and inland fisheries and aquaculture. The Review was formerly identified as Fisheries Circular 710 (Part 1 and 2). For the Twenty-first Session of COFI, March 1995, however, due to the increasing importance of aquaculture production, the Review is produced in three parts, each as a separate document under one title: Review of the State of World Fishery Resources".

It is intended that the Review of the State of the World Fishery Resources will be completely revised every six years, with updates provided biennially.

This circular contains the review of marine fisheries and is an up-date of Technical Paper No. 335, Review of the State of World Marine Fishery Resources, issued in 1994.

FAO Marine Resources Service, Fishery Resources Division.
Review of the state of world fishery resources: marine fisheries.
FAO Fisheries Circular. No. 884. Rome, FAO. 1995. 105p.

ABSTRACT

This paper updates the regular reviews of the state of the world's marine fish stocks, based mainly on statistics through 1992. The introduction refers to the limits of world fish production, documents and draws attention to the implications of the high level of exploitation of the more valuable marine resources, and notes for each FAO statistical area, the major changes and trends that have occurred in specific resources. Special sections address the environmental issues in marine fisheries, and provide a perspective on the fishery assessment strategies in current use in support of fisheries management in each region. Tables are provided for each statistical area showing recent landings for the major resources, and judgements on the current state of exploitation of the major marine resources.

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[1] General editing by J. Cannon, Imperial College, London

A. INTRODUCTION

Recent trends in world fisheries

The analysis of the world marine fish catch and status of stocks made in 1992 in the previous revision of this document, was issued in 1993 as FAO Fisheries Technical Paper No. 335. It presented, together with the special Chapter of the 1992 FAO review of the State of Food and Agriculture (SOFA), a sobering diagnosis of the state of world marine resources; a diagnosis which was widely reported in the world media. These documents set the scene for the deliberations of the United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks whose sessions began in 1993, and has contributed to the sense of urgency with which member countries of FAO have called for the development of a Code of Conduct for Responsible Fishing.

The present document should be largely regarded as providing supplementary information to that contained in the previously cited technical paper without, for the greater part, rendering its conclusions in any way obsolete. FAO Fisheries Technical Paper No. 335 pointed to a considerable excess of fishing capacity as a primary cause of the over-exploitation. This theme was illustrated particularly clearly by the declines in the landings and stock condition of high value demersal and shellfish species, and the frequent substitution of these species by others of formerly low economic value. However, there are several other themes only briefly touched on in the technical paper, that require consideration by the Committee on Fisheries in order to diagnose the current situation and describe corrective measures to ameliorate the imbalance between fishing effort and the productive capacity of stocks. The additional themes that require highlighting are elaborated on in this circular, are as follows:

(1) A shift towards re-evaluating the importance of environmental effects in marine fisheries is not just a recognition of the importance given to these factors by the UN Conference on Environment and Development (UNCED), Rio de Janeiro, June 1992 and its Agenda 21 for the Oceans, but reflects objective analysis that long-term trends and fluctuations in environmental conditions are of key importance to fisheries production. Decadal scale changes in oceanic conditions (themselves end results of a periodicity in global meteorological patterns) are reflected in fluctuations in recruitment, which often are roughly synchronous for widely separated regions of the world's oceans.

(2) With respect to long-term trends, the preoccupation with climate warming trends and their predicted effects on coastal and upwelling fisheries has received much attention. Less noted are other long-term trends affecting particularly the high latitude oceans, and coastal and semi-enclosed seas. Due to the thinning of the stratospheric ozone layer high and low latitude seas are receiving increased levels of ultraviolet radiation, the full impact of which is not yet known. Increased runoff of materials and nutrients into coastal and semi-enclosed seas is changing species compositions and catch trends. Similarly, it is increasingly recognized that the introduction of exotic species by man also impacts other species in the ecosystem.

(3) Growing concern is being expressed at the progressive loss due to human activities of critical habitats needed by many marine species during certain life history stages. These

important ecosystems include estuaries, coastal vegetation and wetlands. Such areas are all prone to impacts from pollution, water withdrawal for human use, and land reclamation for various purposes, of which coastal aquaculture deserves particular mention. At the other end of the scale of water quality, we should not forget especially for island States of the tropics, the importance of coral reef ecosystems, which are especially sensitive to pollution and other human activities. These issues fall within the sphere of Integrated Coastal Area Management (ICAM), but deserve at least some mention here. We may expect that along with stock rebuilding, we will require more attention to be paid to habitat restoration and protection in order to achieve increased physical productivity of fish stocks and improved economic benefits to coastal States.

(4) That open access fishery regimes have been a major cause of over-capacity is now well established. By contrast, geographical differentiation of user-rights is a largely under-utilized marine resource management tool whose day may soon be arriving. At this stage it is too early to speak of the growing role of Geographical Information Systems (GIS) in providing the required data for the spatial differentiation of user rights, but the results of early analyses are promising. A better understanding of the geographical variations in fisheries production will enable coastal States to implement a range of effective new geographically-differentiated tools for dealing with access-rights.

(5) The global economic context of world fisheries has also played an important role in changing exploitation patterns. For instance, the transition towards fulfilling the needs of a progressively coordinated global market for fish products by distant-water fleets of formerly central planned economies, has been one unexpected factor which is having its repercussions. For instance, it is leading to declines of the once important landings of lower value small pelagic fish by these fleets in some developing countries. This phenomenon is relevant to food security in West Africa and elsewhere, leading to calls for more investment by coastal countries themselves in the capture of low-value species. The increased effort by the upgraded fleets of countries now seeking hard currency sales, will also have impacts on high value resources which may already be under considerable pressure.

(6) The new perspectives provided by the ongoing UN Conference mentioned above, on improved management of straddling and highly-migratory resources has not yet been fully appreciated, but deserve mention here. There has been widespread agreement on the importance of precautionary approaches in management and the use of cautious reference points by which such management should be guided. However, the acceptance of these ideas has not yet been fully matched by the appreciation that resources need to be managed as population units, whichever jurisdiction(s) they fall into.

Many heavily fished stocks are clearly in need of rebuilding, and this will require sharp reductions of fishing effort over periods that, for longer lived species, may approach or exceed a decade. If implemented, such ecologically responsible measures will have the side-effect of reducing world landings for a number of years and lead to increases in prices at dockside to the industry in the medium to long term.

The alternative scenario of continued increases in effort is expected to lead to the progressive rarity of currently higher priced fishery commodities, and will require means of transforming low value species, and currently large volumes of by-catch now being discarded into commercially acceptable products. Variants of the surimi process are likely to arise, and the progressive diversion of low value fish species from fish meal to human food.

A final scenario, especially in the tropics, is that the remaining low grade species and undersized fish now predominating in the catches will be increasingly used as food stock for coastal aquaculture.

Although the three scenarios just presented are evidently exaggerations, they could form the basis for reflection by COFI as to the type of world marine fishery COFI hopes to see developing in the early years of the 21st century. We may note that each of the three scenarios just painted will have their concomitant optima as far as the type of fishing industry that will be favoured. In the case of adopting strategies for stock recovery, a wide diversity of fish products will be maintained, and even in a period of harvest constraint, employment of fishermen could be maximized by placing the emphasis on development of small, often multi-purpose vessels with modern technology. We may note that the two scenarios are low diversity in the nature of fisheries supported, favour economies of scale and industrial vessel operations, have high ecosystem impacts with relatively low-levels of employment in the catching sector. In both cases, high value products are eventually favoured that will not contribute notably to food security in the poorer communities.

B. REGIONAL REVIEWS

NORTHWEST ATLANTIC (Area 21) (Table 5)

Total landings of finfish and invertebrates in 1992 were 2.6 million metric tons (t), a reduction of 20% compared to 1990 and below the average level of landings seen during the 1970s and 1980s. The downward trend in landings from 1990 to 1992 can be attributed to the decline in catches of demersal fish, with nearly 50% of the drop being due to the reduced catch of Northern Atlantic cod. However, landings for all major species groups declined. The shift by demersal fisheries toward landing formerly low value species following the gadoid collapse continues, although the absolute quantities being landed has decreased markedly between 1990 and 1992, particularly for silver hake, Atlantic redfish, and pollock. Total landings of capelin declined significantly (from 183 792 t in 1990 to 30 978 t in 1992).

The problems encountered in managing stocks which extend beyond the Extended Economic Zones (EEZs) of coastal States (as described in FAO Fisheries Technical Paper No. 335) continues. A key feature is the continuing fishing activities of non-Contracting Parties in the North Atlantic Fisheries Organization (NAFO) Regulatory Area. Of particular note is the problem caused by flag of convenience vessels. Despite declines in the size of stocks of several species in traditional areas, fishing effort has expanded at an alarming rate outside the 200-mile limit, in the Davis Strait and on the deep continental slope. Such concerns have been the primary focus of FAO's paper "The Precautionary Approach to Fisheries Management", prepared at the request of the United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks, held in New York, March 1994.

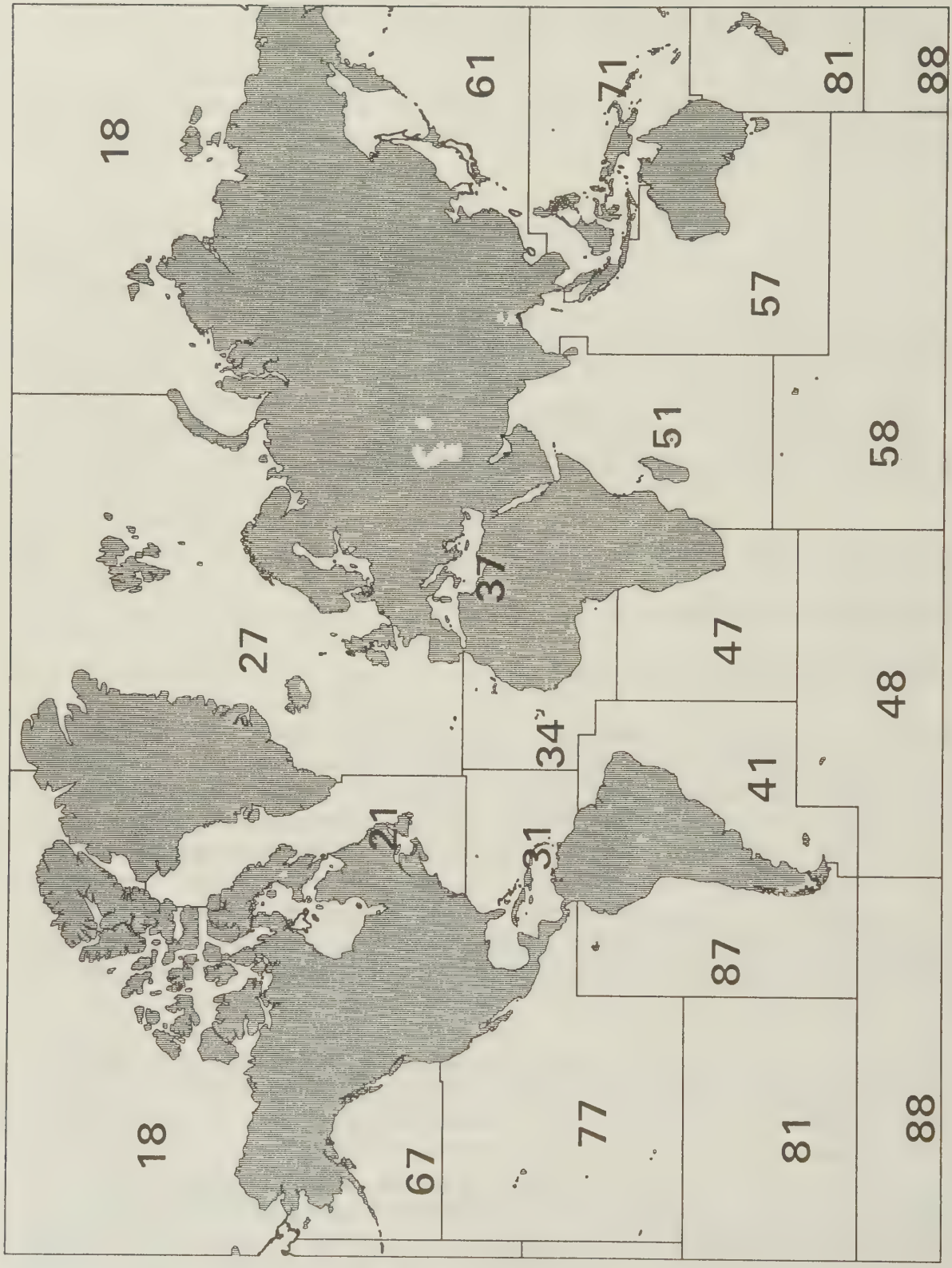


Figure 1: Geographical boundaries of FAO marine statistical areas

Another management problem in Area 21, the difficulties in getting timely data for stock assessments (see FAO Fisheries Technical Paper No. 335), has now been explicitly recognized in the management of Atlantic Canada's fisheries. Due to unavoidable delays in collecting and processing data, the most "recent" data that can be used in annual stock assessments is often two years old. It has been observed that incidences of misreporting by species and areas correspond with periods when quotas should have been limiting landings from specific stocks. Dumping, high grading and discarding are, at times, major problems which continue. These inaccuracies in the reporting of catches continue to affect estimates of total removals.

I. Northern Areas

The situation for demersal fish in Atlantic waters off Canada in most ways remains unchanged from that of a year ago. The status of the northern cod stocks continues to be considered perilous and the relative importance of the underlying causes, past heavy fishing and environmental changes (notably falling water temperatures), is still unsure and may remain so. The period of low temperatures in the northern coastal waters described in FAO Fisheries Technical Paper No. 335 continued with the offshore ice limit in 1993 approaching the long-term maximum. In mid-1992 it was determined that the cod stocks were at their lowest levels ever and at only about 10% of their long-term average. Subsequent evidence indicated that abundance has continued to decline and at the end of 1993 was only 5% of its long-term average level. Groundfish, and particularly cod, have been the mainstay of the Atlantic fisheries providing about 60% of the catch by weight and 40% by value. Cod alone accounted for almost 40% of Newfoundland exports of fish products.

The spawning stock biomass (SSB) of cod in Divisions 2J, 3K and 3L had declined from 323 000 t in 1988 to about 19 000 t in 1992, while catches declined from 269 000 t to about 44 000 t. All year-classes from 1988 to 1992 are considered likely to be poor. A similar trend is evident for cod in Divisions 3N and 3O. Redfish stocks have declined in all areas, other than perhaps Division 3M where the stock may have stabilized. The SSB of American plaice in Divisions 3L, 3N and 3O has been declining throughout the late 1980s and early 1990s. NAFO's Standing Committee on Fisheries Science recommended that the 1994 catch be kept at the lowest possible level.

In response to the serious declines in stock sizes of several species in the Northwest Atlantic, moratoria have been placed on several groundfish stocks by Canada within its EEZ and NAFO in its Regulatory Area outside 200-mile limits.

As a consequence of the moratoria on nearly all Canadian cod fisheries, Canada has undertaken a massive social "Northern Cod Adjustment and Recovery Program". While providing social assistance to affected individuals, this programme is also taking the opportunity to match harvesting and processing capacity to the natural limits of the resource. Fisheries in Eastern Canada provide an excellent example of fisheries whose management objectives, while stated in rather incoherent terms, cover a wide range of primarily social objectives. For many of the fisheries, fishermen's incomes depend significantly on social welfare transfer payments paid to provide incomes to fishermen outside of fishing seasons. Thus the participation of fishermen in the industry often is in a manner controlled by the requirements to qualify for social welfare payments.

If the fishery is to be rationalized it is recognized the harvesting capacity and size of the workforce must be consistent with the ability of the resource to provide adequate incomes and adequate levels of employment. As in many other fisheries around the world this confronts decision-makers with the difficult choice between compromising numbers of fishermen employed with level of income per fisherman. Much progress remains to be achieved.

In Canada, Individual Transferable Quotas (ITQs) have been introduced for some gear sectors of the Scotia-Fundy demersal fisheries. Other forms of quasi-property rights have existed for some time in the form of enterprise allocations (EAs) for the offshore scallop fisheries. Such "EAs" have proved popular with the industry in this case and are credited with resulting in rational and profitable exploitation.

The Government of Canada, in an effort to address serious resource management issues, has created a Fisheries Resource Conservation Council, a body whose mandate includes: assisting the government achieve its conservation, economic and social objectives for the fisheries including rebuilding stock and maintaining them at "optimum" levels; improving the integration of scientific expertise with the knowledge and experience of all sectors of the industry, and providing a mechanism for public and industry advice and review of stock assessment information. This Council is not part of the Department of Fisheries and thus is not required to follow departmental policy.

In a 1993 report to the Minister of Fisheries, the Council's recommendations make discouraging reading. For example, in the Scotia-Fundy region they recommended that the 3Ps American Plaice, the 4Vn(M-D) cod fishery and the 4VsW cod fisheries be halted immediately; that the area 3 cod, the 4TVn(J-A) cod and the 5Zjm haddock and cod fisheries be closed; and that TACs for the 4RS-3Pn, 4VWX-5Zc and 4X cod fisheries be reduced.

Some of these stocks straddle the boundary between Canada's EEZ and NAFO's Regulatory Area. It has been long understood, demonstrated and documented that this straddling feature can confound efforts to control exploitation in a consistent manner across an entire stock. A particular recent case of note is the Greenland halibut stock whose range is between Greenland and Canada, from high latitudes to the southern Grand Banks. With the collapse of cod fisheries in the area, this resource assumed important social dimensions. The TAC for subareas 2 and 3, which historically have never been restrictive, reduced from 100 000 to 50 000 t in 1990, and to 25 000 t in 1994, while during the late eighties the catch was stable around 20 000 t per year. However, the "unregulated" fishery outside the 200-mile limit has exploded, from 7 600 t in 1989 to 57 000 t in 1993. The Fisheries Resource Conservation Council of Canada describes the stock situation as "alarming", with "the absence of mature individuals", and very few year-classes contributing to the total biomass. This represents a dramatic change of fortune for the Greenland halibut stocks compared to the situation reported in FAO Fisheries Technical Paper No. 335.

Canada has expressed serious concern at the continued high seas fishing on the "Nose" and "Tail" of the Grand Banks by stateless and flag of convenience vessels in spite of the NAFO moratoria, and became the first nation to become party to, and implement, the UN FAO International Agreement to Promote Compliance with International Conservation and

Management Measures for Fishing Vessels on the High Seas (known as the "Compliance Agreement"). Under the Agreement's terms, which at the time of writing will come into force following the acceptance of a further 18 States, nations must control high seas fishing by vessels flying their flags to ensure that the conservation and management decisions of international and regional fisheries organizations are upheld. As a further measure, Canada has unilaterally brought in new regulations that allow action to be taken against vessels of flags states not contracting parties to NAFO fishing outside its 200-mile limit.

Along with other countries, Canada has also been concerned with the problem of setting management objectives. In a recent workshop on groundfish management in the Scotia-Fundy region, it was concluded that there had been inadequate articulation at the policy level in balancing the objectives of conservation, economic performance, employment and "Canadianization". At the operation level, management targets had not been set such that consistent decision-making was possible within a well understood overall strategy. While conservation objectives have been successfully operationalized, the objectives of employment and economic performance and Canadianization were addressed in an ad hoc fashion. Undocumented (i.e., unarticulated) objectives for social objectives were vague and did not permit explicit goals to be set for operational management. The inter-relation and non-exclusivity of the different objectives had not been explicitly considered so that policy was unavoidably incoherent.

II. Southern Areas

As with demersal fisheries to the north, stock sizes of demersal fishes in the northeast USA are low: the 1992 groundfish index is at a 30-year low, and this corresponds to the whole period over which a time-series has been maintained. Landings were expected to further substantially decline in 1993. Recent landings of the Gadoid-flatfish-redfish populations (12 species comprising 19 stocks) has averaged 161 000 t per year compared to a long-term potential yield of nearly 400 000 t per year. Present landings of these fishes are their lowest since the 1950s when effort and demand was low. Despite this, there was still a recent increase in fishing effort!

Associated with the decline in the abundance of the traditional demersal species there has been an increase in abundance of sharks and rays. The stock of these two groups are at the highest since a survey index was started in 1986 and the proportion of the catch of sharks and rays in the catch of groundfish surveys has, in recent years, increased to nearly 75% from 25% in 1963.

The New England groundfish are regulated through indirect controls such as mesh-size, minimum size restrictions and some area closures. In the face of continued over-exploitation of the groundfish resources, the Conservation Law Foundation and the Massachusetts Audubon Society filed litigation aimed at reducing over-fished conditions. An agreement was reached with the National Marine Fisheries Service (NMFS) stipulating that measures would be introduced that would remove the overfished conditions within the next five years in the case of cod and yellowtail, and within the next ten years in the case of haddock.

A change to the New England Multispecies Fishery Management Plan (Amendment #5) calls for a reduction in effort beginning in 1994. This package of restrictions includes a moratorium on new vessels entering the fishery, a schedule of reductions in days at sea for

trawlers and gillnet vessels equivalent to 10% per year, increases in mesh-size, and extended closed areas to protect haddock stocks. For example, the haddock spawning area closure has tripled in size from 620 km^2 to nearly 2 000 km^2 and the seasonal closure extended until 1 July. Associated with the new plan was, for the first time, financial assistance of US$2.5 million for the industry.

Many of the groundfish species taken by New England vessels are shared with Canada: e.g. in 1992, 42% of Georges Bank cod, 67% of haddock and 78% of pollack was taken by Canadian vessels. Though there are mechanisms for collaborative stock assessment there is no formal cooperative management.

Abundance of pelagic species in this area has fluctuated considerably in the last 25 years. Atlantic mackerel is a species that could sustain considerably higher catches at this time. This species, which moves into Canadian waters in the summer, has a stock-size of about 2.5 million t though landings have been very low, only 38 300 t in 1992, because of poor market demand. Catches could be considerably increased with no threat to sustainability. The once prolific Georges Bank herring stock, which was nearly fished to extinction in the late sixties with catches of over 370 000 t per year, is showing signs of recovery. US landings of herring in 1992 were 59 200 t and the stocks should be able to sustain increased exploitation. Herring populations in the Gulf of Maine enter the Bay of Fundy where they are subject to a Canadian fishery; thus the need for joint management of this stock between the two countries.

In the USA, Individual Transferrable Quotas (ITQs) have been implemented in the surf clam-ocean quahog fishery to obviate the need for complex management restrictions. ITQs in this fishery have resulted in a reduction in the fleet size from 160 vessels to less than 100 vessels in the first year and a further reduction in fleet size is expected.

Lobsters and scallops are the most valuable marine resources in the area. 1992 saw the first significant downturn in lobster catches since 1975, though the level of landings is still high relative to the long-term average. Landings could be augmented by increasing the minimum carapace size, but the industry is concerned that market share for the smaller "canner" and "market" grade lobsters would then be lost to Canadian producers who catch their lobsters at a size that is too small to maximize benefits to the fishermen and other industry sectors.

It is recognized that fishing mortality on sea scallops on the US side of Georges Bank is far in excess of that level which would maximize cohort yields and exceeds recruitment over-fishing reference points. The New England Fishery Management Council has developed a planned amendment to reduce fishing effort and prevent new entrants to the fishery, and to increase the mesh size used in the dredges employed to capture the shellfish. On the Canadian side of the Bank, enterprise allocations appear to be maintaining high industry profitability and controlling overall fishing effort.

NORTHEAST ATLANTIC (AREA 27) (TABLE 6)

Total reported catches in 1992 were 2.6 million t, down slightly from 3.0 million t in 1991. Of the 2.6 million t, 1.6 million t were finfish and 1.0 million t were invertebrates.

Most of the demersal groundfish stocks remained at a low level and some continued to exhibit long-term downward trends due to various factors, as discussed in FAO Fisheries Technical Paper No. 335.

I. North Sea and Western Scotland

The main North Sea demersal stocks harvested for human consumption purposes (cod, haddock, saithe, whiting, sole, and plaice) continue to be intensively exploited. The recent fishing mortality rates (F) for all the stocks are the highest in their respective historical time series. Thus the size of stocks and catches continue to be dependent on the irregular occurrence of abundant year-classes. Less than one third of the fish alive at the start of the year survive to the end of the year and few individuals of greater than age two are present. If the current level of fishing mortality is maintained in the future, all these stocks are expected to remain close to or outside safe biological limits for long periods, possibly interrupted by short temporary periods of recovery when a good year-class is produced.

The North Sea cod spawning stock seems to have stabilized at a very low level, approximately one third of the level of 150 000 t which is considered to be the lowest desirable biological level. Only one of the year-classes recruited since the strong 1985 year-class appears to be around average; the others are all below average. As management action to reduce fishing mortality seems unlikely in the near future, the spawning stock-size will probably remain at a low level which, in conjunction with the recent series of poor recruitment, gives rise to serious concern that the stock is no longer able to replenish itself.

Since the record low in spawning stock size of haddock in 1985 (see FAO Fisheries Technical Paper No. 335) a slight increase is indicated due to the recruitment of year-classes that have been average or above average. The spawning stock is expected to increase in 1993 and 1994 due to the recruitment of these year-classes but will decrease below safe biological limits if a few poorer year-classes are recruited and the present fishing mortality maintained. Sequences of poor year-classes are common in the time series of recruitment to the haddock stock and must be expected to occur regularly in the future.

The spawning stock biomass of whiting appears to have stabilized close to a historical minimum level. The major part of the spawning stock now consists of two poor year-classes. A slight increase in the spawning stock size in 1993-1995 is, however, expected with the present level of exploitation. Fishing mortality is high, but whiting is a predator on other commercial species and a large whiting stock might therefore have a negative impact on these.

The situation with the saithe stock continues to be unclear. The spawning stock was at a historical low in 1990 and 1991 but seems to have improved due to good recruitment. The prospects for the stock are uncertain due to lack of recruitment data and due to unpredictable migrations in and out of the North Sea.

The North Sea sole stock is considered to be within safe biological limits. The spawning stock size is well above the minimum level due to the very abundant 1987 year-class. After a short period of decline the spawning stock size is expected to rise again in 1994 due to the recruitment of the good 1991 year-class. However, with the present level

of fishing mortality there is a risk that the spawning stock-size will fall below safe biological limits in the long run.

The plaice stock is declining slightly; however, as a result of a series of average recruitment, the spawning stock size is estimated to be just above the minimum desirable level. There has been a decline in catches by all fleets. The stock is expected to decline to a level close to the minimum desirable level of 300 000 t in the near future. It has recently been discovered that some of the estimates of the misreported catches in previous years might have been over-estimates and this surrounds the assessment with some uncertainty. It might well be that the actual spawning stock-size is already at or below the minimum desirable level.

The North Sea mackerel stock is still at a very low level and maximum protection is recommended by the International Council for the Exploration of the Seas (ICES). The relatively stable western stock (see FAO Fisheries Technical Paper No. 335) continues to be healthy (in 1993 it was 2.90 million t) due to the fact that the stock is fished at moderate levels of fishing mortality and there has been good recruitment.

Following the collapse of the North Sea herring stock in the mid-1970s (see FAO Fisheries Technical Paper No. 335), and subsequent closure of the fishery, the spawning stock-size peaked at 1.4 million t in 1989. The spawning stock-size is decreasing again, and is now thought to be close to or below a minimum acceptable level of 800 000 t.

The small-meshed trawl industrial fishery (described in FAO Fisheries Technical Paper No. 335) reported landings of 1.6 million t in 1992. Sandeel was the main species, as in previous years, with 854 000 t followed by Norway pout 252 000 t, sprat 214 000 t, and herring 128 000 t.

II. Baltic Sea

Cod in the Baltic has been exposed to a high and steadily increasing fishing mortality. Since 1989 the fishing mortality has been over 1.0. The spawning stock size of the large stock in the central Baltic has declined from over 800 000 t in 1980 to under 100 000 t in 1992 and has been below the minimum biological acceptable level (MBAL) for several years. ICES has recommended a total stop for cod fisheries in the central Baltic in 1995. The agreed TACs have, in the past, generally been higher than those recommended by ICES. A catch similar to the TAC for 1993 of 40 000 t would have meant a reduction in F of about 50%, but due to misreporting and illegal catches the actual catch became much higher and F was not reduced. For 1995 the managers have agreed on a TAC of 100 000 t for the total Baltic. For the central Baltic cod this will mean a continuation of the high level of fishing mortality. Fortunately, a reasonable 1991 year-class appeared and this will prevent the stock from decreasing further. All other year-classes since 1986 have been poor. The poor recruitment seems to have been caused by a low spawning stock and poor environmental conditions (see FAO Fisheries Technical Paper No. 335). A new strong inflow of North Sea water took place in 1993 and this has improved the salinity and oxygen conditions in the Baltic. The spawning stock size might, however, be too small at present to take full advantage of this, in terms of producing good recruitment, and there is no way at present of predicting recurrences of favourable 1993 environmental conditions.

III. Northeast Arctic and the Barents and Norwegian Seas

The Northeast Arctic cod stock was depleted in the 1970s and first half of the 1980s, but a significant reduction in fishing mortality occurred from 1989 to 1990 due to a low TAC, and a good 1983 year-class, and good growth have rebuilt the stock to a healthy level. The catches have increased to about 500 000 t in 1992 and the spawning stock has gone up from 152 000 t in 1987 to 1.05 million t in 1992. Capelin is an important food item for this cod stock and the good growth was based on high abundance of capelin. The capelin stock is now again very low and it is uncertain how the growth of cod will be affected. The effect might not be large because the Norwegian spring spawning herring stock is now recovering and might replace capelin as food for cod.

The Barents Sea capelin stock has again declined. After its recovery in 1990 when the spawning stock reached 2.6 million t, the spawning stock has now decreased to well below the target stock-size of 400 000 - 500 000 t. There was no fishery on this stock in 1987-1990. In 1991 and 1992 about 1 million t were caught each year.

The recovery of the Norwegian spring spawning herring stock (see FAO Fisheries Technical Paper No. 335) continues, reaching about 2.4 million t in 1993. The stock is now at or above the lowest level known to have given good year-classes in the period prior to the collapse, and the stock has produced good year-classes in 1989 and 1990. In addition there are strong indications that the 1992 year-class is very good. The stock is, therefore, expected to increase further, maybe even to former size levels. This stock has now begun to be harvested and the TAC for 1993 was set at 200 000 t in order to ensure that the fishery develops in an orderly manner.

IV. Iceland, Greenland and the Faroe Islands

The Icelandic cod stock has declined more or less steadily from about 1.4 million t spawning stock size in 1955 to 209 000 t in 1993. In the same period F has increased from about 0.3 to about 0.9. The stock is now considered at or below the minimum biologically acceptable level. ICES therefore recommends a significant reduction in fishing mortality. The recommended TAC for 1993 was 154 000 t but the agreed TAC was 205 000 t. In some years large amounts of immature cod of this stock are found west of Greenland supporting a large fishery. In 1989, 112 000 t were caught in west Greenland waters due to the high abundance of the 1984 year-class. However, this year-class migrated back to Iceland during the following years when they matured and the catches went down to almost zero in 1993.

The saithe, cod and haddock stocks around the Faroe Islands are all suffering from high fishing pressure and are below biologically acceptable levels. ICES recommends no fishing for cod and haddock and a significant reduction in the fishery on saithe.

The Iceland/East Greenland capelin stock has increased again from a spawning stock size of 115 000 t in 1989 to 500 000 t in 1992. The fishery is managed in a way that maintains the spawning stock at 400 000 t at spawning time. The catches were between 600 000 t and 1.29 million t in 1986-1990, 740 000 t in 1991 and 900 000 t in 1992. Because of the short lifespan of capelin the state of these stocks is highly variable.

The Icelandic summer spawning herring stock supported slightly increased catches of a little more than 100 000 t in 1989-1992. The spawning stock decreased from 429 000 t in 1988 to 310 000 t in 1991 but is now increasing due to good recruitment. The spawning stock size was 480 000 t in 1993, which is the highest level observed.

Catches and exploitation levels in the traditional redfish fisheries around Iceland, East Greenland and the Faroe Islands have been declining slowly in latter years and the 1992 catch was the lowest since 1980. The size of the stock is uncertain due to problems in ageing redfish. Catches from the relatively new fishery on an oceanic stock of *Sebastes mentella* (see FAO Fisheries Technical Paper No. 335) increased to 56 000 t in 1992 following recent declines. An acoustic estimate of the stock size indicates that the stock biomass is around 1.9 million t.

V. Miscellaneous Stocks

Other smaller herring stocks which have increased or are still at a stable level, include those in Skagerrak-Kattegat and the western Baltic, several areas west of Scotland and Ireland, and several in other parts of the Baltic. The main stock in the Baltic has experienced a decrease in fishing mortality and an increase in spawning stock size, which is now approaching 2 million t.

The epidemic in various herring stocks caused by the fungus *Ichthyophonus* sp. (see FAO Fisheries Technical Paper No. 335) has reduced. The exact impact on the stocks has not yet been assessed but it seems that the herring in the North Sea and Skagerrak-Kattegat and the western Baltic were mainly affected in 1991 with high mortality rates of adult herring in that year.

Hake landings in Skagerrak, the North Sea, around the British Islands, the Bay of Biscay, the northern coast of Spain and off Portugal have remained fairly stable since 1978 at around 70 000 to 80 000 t. The hake stocks have declined since 1987 and in 1992 were the lowest in the period 1978-1992. The stocks are outside safe biological limits and ICES recommends a significantly reduced fishing mortality. A large number of under-sized fish are caught and these are usually discarded. The landings of sardine from the area north of Spain and off Portugal have decreased from about 200 000 t in 1980-1985 to 128 000 t and 126 000 t in 1991 and 1992. Catches of European anchovy in the Bay of Biscay and off Portugal have fluctuated between 5 000 t and 41 000 t since 1979.

Landings of blue whiting in the northern areas dropped from 1.1 million t in 1979-1980 to 446 000 t in 1992. The spawning stock has decreased from a peak level in 1988, but the decline halted in 1992 and the stock is now increasing due to the strong 1989 year-class. Horse mackerel landings were 437 000 t in 1992 which is almost equal to the previous two years. The stocks are still dominated by the very strong 1982 year-class. Other year-classes are weak, with the possible exception of the 1987 and 1989 year-classes. The spawning stock of the western stock, the largest of the horse mackerel stocks, was estimated to be 2.3 million t in 1992 and within safe biological limits.

There has been recent interest in fisheries based on deep-water species found on the North Atlantic oceanic slope. These species include blue ling (*Molva diptorygia*), roughhead

and roundnose grenadiers (*Macrourus berglax* and *Coryphaeonoides rupestris* respectively), orange roughy (*Hoplostethus atlanticus*), black scabbard (*Aphanopus carbo*), deep-water redfish (*Sebastes mentella*) and various angler fish (Lophius spp.). Some of these species are currently exploited at low levels, but there is little available information on which to base assessments. However, given the problems arising in the exploitation of orange roughy in New Zealand (see FAO Fisheries Technical Paper No. 335), there are concerns regarding the extent to which fisheries based on these vulnerable species (due to relatively low growth rates and long lifespans) can be sustainably exploited.

VI. Environmental Issues

Pollution impacts are described in FAO Fisheries Technical Paper No. 335 and it was noted that increased levels of fish diseases are often observed in areas of oxygen depletion of bottom water and close to river outlets, but on too small a scale to affect the economically most important fish stocks. However, one exception that has come to light might be salmon in the Baltic Sea. A syndrome called M74 is creating mass mortality in the hatching salmon fry. Only a small percentage of the hatched fry survive and this means that many more spawners have to reach the rivers for spawning than previously in order to keep the year-class sizes at the average level. ICES therefore recommends a total closure of those salmon fisheries in the Baltic that take wild salmon. The causes of the M74 syndrome are not known but there are some indications that it is associated with organochlorine contamination in the female salmon; nutritional factors are also implicated. A complicating factor in the attempt to protect wild salmon is that reared salmon might swamp the wild salmon rivers if reared salmon are not caught. The reared salmon constitutes between 80% and 90% of the total biomass of salmon in the Baltic and most of the time they are mixed with wild salmon on the fishing grounds.

VII. Management Issues

The new ICES procedure and form of fisheries management advice is described in FAO Fisheries Technical Paper No. 335. The problems facing ICES in the enforcement of management measures, as described in the above-mentioned technical paper, are increasing. Efforts to quantify the level of discarding are in progress: some countries have started sampling programmes where staff are sent on board fishing vessels in order to sample discards on a haul-by-haul basis. In the human consumption fishery in the North Sea the discarding on average now amounts to between one third and one half of the total catch in weight. In the industrial fishery for fish meal, discarding is low.

Due to misreporting and accumulating experience of lack of simple relationships between catch-per-unit effort (CPUE) and fish stock size, there is a tendency in fish stock assessments in Area 27 to replace commercial CPUE data by research vessel data, in estimating the current stock-sizes. Partly as a result of this the annual International Bottom Trawl Survey in February in the North Sea has, since 1991, been supplemented by additional surveys in each of the other three quarters of the year.

Due to misreporting, ICES has in some cases in recent years departed from giving advice on catch levels in favour of giving advice on control of fishing mortality by direct effort control, even though the stock sizes were below the MBAL. For cod in the North Sea,

misreporting undermined the TAC system and ICES recommended an effort reduction implemented in such a way that the fishing mortality is reduced by a similar amount. It is then up to management bodies to find ways to obtain this in practice.

ICES has long recognized the need for multi-species assessment and advice, taking into account both biological relationships among species and the technical interactions in mixed species fisheries, and has been actively involved in the relevant research and development of methodology. The multi-species VPA (MSVPA) models developed by ICES scientists for the North Sea and the Baltic are examples of this involvement. A large-scale International Stomach Sampling Programme was conducted in the North Sea in 1991. The aim was to verify the results obtained by the MSVPA based on stomach data sampled mainly in a similar Programme in 1981. The results of the 1991 Programme have largely confirmed the results of the MSVPA based on previous data. By use of the MSVPA in the Baltic, for instance, it has been discovered that cannibalism in the cod stocks is significant in some years and is a strong self-regulatory mechanism maintaining the stock-size at stock-levels experienced in the past. FAO Fisheries Technical Paper No. 335 contains more detail on multi-species stock assessment and the use of MSVPA.

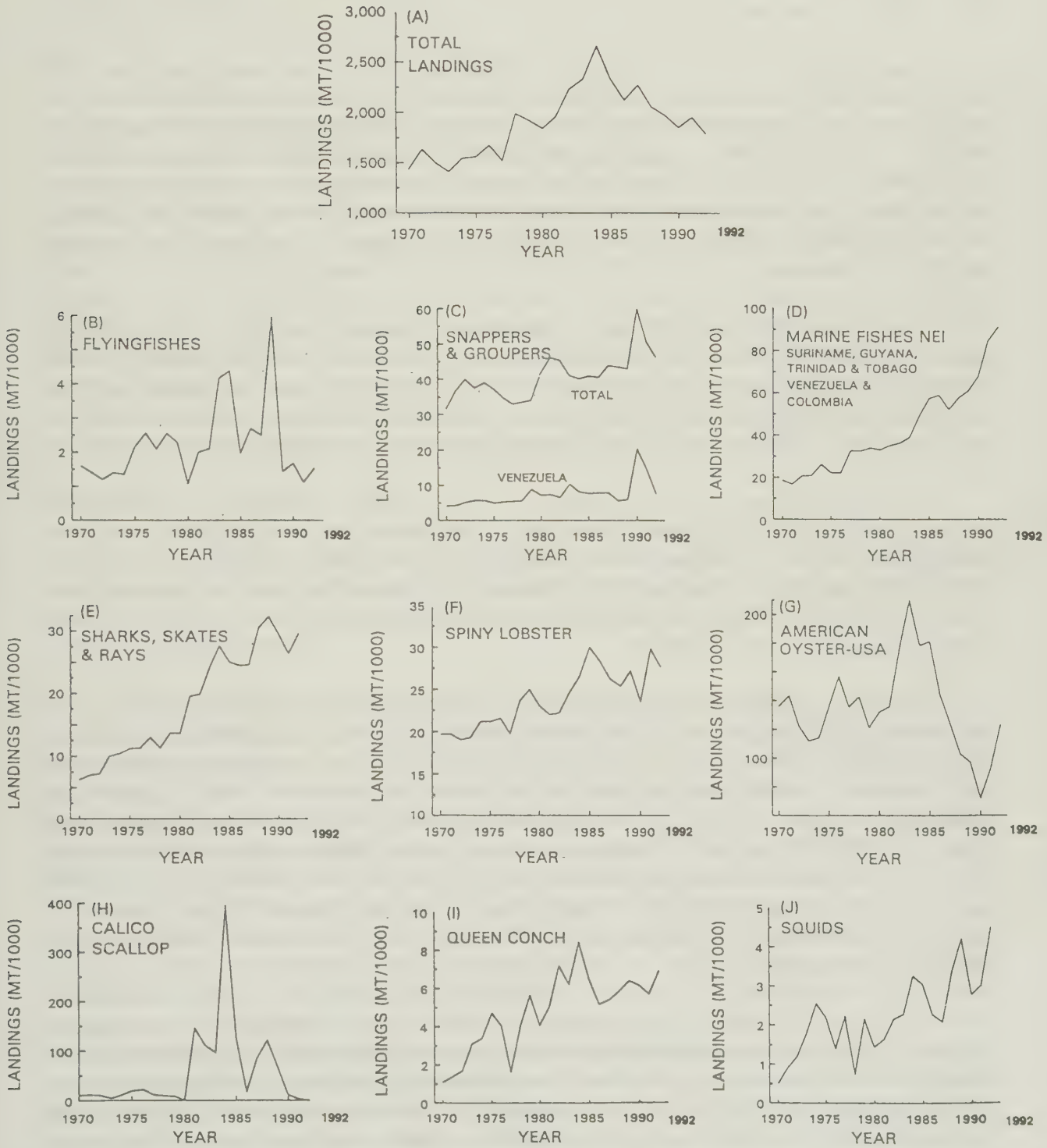
ICES has also been engaged in making one of the most comprehensive quality status reports ever made for a marine ecosystem. This was undertaken for the North Sea by the North Sea Task Force with ICES and the Oslo and Paris Commissions as the main contributors. The effect of the fishery and fishing activity is dealt with and it is for instance shown that each spot of the seabed of the southern half of the North Sea is, on average, swept by a trawler or beam-trawler more than once per year.

WESTERN CENTRAL ATLANTIC (Area 31) (Table 7)

The main fisheries within Area 31 are as noted in FAO Fisheries Technical Paper No. 335, and as shown in the same paper, the oceanography of Area 31 is highly variable, both spatially and temporally. The Gulf of Mexico and the North Coast of South America are dominated by the effects of three of the largest river systems in the world: the Mississippi, Amazon and Orinoco Rivers. The majority of the Caribbean islands are more affected by the oligotrophic North Equatorial Current which enters the Caribbean Sea through the passages between the Lesser Antilles, and those with appreciable shelf area exhibit significant coral reef development. Seasonal and interannual climatic variability are determined by the north-south migration of the intertropical convergence zone. This variability is weakly linked to El Niño/Southern Oscillation events in the equatorial Pacific. The area is also influenced by hurricanes (see FAO Fisheries Technical Paper No. 335), which affect fisheries production locally through their impact on fishing vessels and facilities.

After increasing over 15 years to a high of 2.6 million t in 1984, landings in the area have decreased steadily to 1.7 million t in 1992 Figure (A). Most of this decline is due to three US fisheries: Gulf menhaden, American oyster and calico scallop, which constituted 60% of landings from Area 31 in 1984, but only 35% of landings in 1992. Total landings from the remaining finfish fisheries of the region (i.e. excluding menhaden) were relatively

BOX: Trends in selected resources of the Western Central Atlantic



Source: FAO Yearbook fishery statistics: catches and landings 1992. Vol. 74. Rome, FAO, 677p. (1994)

stable at an average of about 620 000 t from 1982-1989 but increased to an average of about 715 000 t for 1990 through 1992. Over this period landings of sharks and rays, other pelagics, snappers, king and Spanish mackerel, and unidentified fishes have increased while other finfishes have remained stable or decreased slightly.

I. Pelagic Resources

Total landings of small pelagics are dominated by US menhaden fisheries. Gulf menhaden is fully exploited. Atlantic menhaden is over-exploited and a limited increase in landings can be expected if stock-sizes recover through quota management. However, the majority, about 90%, of the catch from this stock, is landed in area 21. Acoustic surveys by R/V *FRIDTJOF NANSEN* indicated that there are substantial stocks of small pelagics off the north coast of South America from Surinam to Colombia. These consist of primarily clupeids, engraulids and carangids, which are virtually unexploited, except by Venezuela in the Isla Margarita area.

Coastal migratory pelagics (mainly scombrids, carangids, and belonids) are heavily exploited in most areas and over-exploited in a few. In US waters, the use of these resources by both commercial and recreational fisheries leads to conflicts between user groups. In other States the migratory behaviour of these fish and the fact that they support artisanal, industrial and recreational fisheries makes their assessment and management a very difficult task.

Flyingfish remain a significant resource in the southeastern Caribbean, with Barbados landing the majority of the catch. There was an increasing trend in landings through the 1980s owing to the rapid expansion of the fleet and the area fished. Recently, landings have declined due to a fishing agreement which has reduced effort in the principal fishing area off Tobago Figure (B). Despite considerable fluctuations in abundance, there are no indications that this resource is over-exploited.

Fisheries for offshore pelagics expanded within the region throughout the 1980s. This was primarily due to purse-seine and longline fishing for tunas by Venezuela and swordfish fishing by US longline vessels. In the mid-1980s, many of the Venezuelan vessels shifted their area of operation from the west central Atlantic to the eastern Pacific, and recent fluctuations in tuna landings are primarily determined by their movements between these areas. From 1982 through 1990, the US swordfish longline fleet expanded its operations into the southeast Caribbean as far as the north coast of South America. The effort by artisanal and small commercial fisheries for offshore pelagics has also increased through this period, particularly in the eastern Caribbean islands. This has contributed to the increase in landings of tunas and other pelagics.

The stocks of many tuna and tuna-like species extend outside the area and are migratory. Their utilization and rational management will require close collaboration among countries within and outside the region. The International Commission for the Conservation of Atlantic Tunas (ICCAT) currently provides a forum for the management of these species. Recently, the 12 Member States of the Caribbean Community and Common Market for (CARICOM) have become involved in ICCAT activities. Stocks of several species are contained within the region but will still require international collaboration for management.

As noted by ICCAT in its 1994 biennial report the major stocks of offshore pelagics are considered to be fully exploited (yellowfin tuna, skipjack tuna, albacore) or over-exploited (bluefin tuna, swordfish, blue and white marlin). Only bigeye tuna are considered to have scope for increased yield. There is little or no information on the status and potential of other species such as blackfin tuna, dolphinfish, little tuna, wahoo, and king mackerel, outside US waters.

II. Reef Resources

In general, knowledge of the status of reef fish stocks continues to be poor due to various factors (see FAO Fisheries Technical Paper No. 335). In addition to the factors described in this paper, in countries where the fisheries are primarily small-scale/artisanal, data on landings are inaccurate because of the widely dispersed nature of the fishery. Reef resources continue to be extremely over-exploited. Evidence in support of this is the high proportion of low valued species, and the small size of all species in the catch. A serious problem with over-exploitation of reef fishes, here and elsewhere in the tropics, relates to the extreme vulnerability of spawning aggregations to fishing. This problem is mostly well known for groupers (see FAO Fisheries Technical Paper No. 335), but appears to be a concern for at least six other families of reef fishes as well. Ciguatera poisoning continues to be an impediment to effective utilization of reef fish resources in the northern Lesser Antilles and Puerto Rico.

III. Demersal Resources

Deep water demersal resources such as snappers and groupers may be under-exploited around island platforms but their estimated potential yield seems small. Along the shelf slope from Brazil to Colombia, deep-water snapper resources are probably considerable, but may already be fully exploited.

The landings of snapper-grouper by Venezuela, the country most active in this fishery, have increased steadily through the past two decades, and as noted by the Western Central Atlantic Fisheries Commission (WECAFC) Working Party on Assessment of Marine Fishery Resources in 1988, are probably under-estimated because much of the catch is taken off the Guyana-Brazil shelf and landed in other Caribbean countries. A major peak in landings for 1990, believed to be due to changes in the port of landing and to increased reporting of the catch, raises concern as to the accuracy of earlier reported landings Figure (C).

Fisheries for coastal demersal fishes other than coral reef fishes take place mainly on the northeastern continental shelf of South America, in the Gulf of Mexico and off the southeastern USA. In US waters, recreational fisheries take about half of the catch consumed, mainly sciaenids. Although the long-term potential yield of most US stocks of coastal demersals is unknown, all their stocks are considered to be over-exploited. Owing to the economic value of sport fishing, recent regulations favour recreational fishers. Off South America, the catch is more diverse; catfishes and sciaenids are important. Inshore, small-scale fisheries take a significant component of the landed catch. Recently, there has been an increase in trawling, targeting finfish on the shelf in the Guyana-Brazil area. These landings, of which snappers are a significant component, and those of the inshore fisheries, including coastal pelagic species, are reported as unidentified marine fishes. Landings in this category

by the countries along the north coast of South America have increased steadily over the past 20 years Figure (D). The recent estimates of potential yield in this area based on acoustic biomass surveys by the RV *FRIDTJOF NANSEN* suggest that some of these resources are likely to be over-exploited. A more precise breakdown of the catch is required for comparison with the survey estimates.

Landings of sharks, skates and rays appear to be levelling after a steep increase between 1977 and 1985 Figure (E). These species are caught primarily in continental shelf areas influenced by river outflow. Their potential yield in most areas is unknown, but their low fertility and/or slow growth makes them particularly susceptible to over-fishing. In the waters of the USA coastal species are fully to over-exploited. Pelagic and demersal sharks are not well distinguished in the reported landings, and information on the former is lacking.

IV. Crustacean and Mollusc Resources

The major shrimp fisheries of the region are over-capitalized, and the resources appear to be fully exploited. Although growth and recruitment over-fishing are of concern, the main thrust of shrimp management is economic optimization of harvesting. Conflicts between the shrimp industry and the US Government over by-catch issues continue. The USA and Mexico cooperate in management of common shrimp resources in the Gulf of Mexico. Collaboration in the Guyana-Brazil region has been initiated through a series of workshops, but lacks funding.

Concern has increased in recent years over the effect that the intense trawl fishery for shrimp in the northern Gulf of Mexico has had on species taken incidentally in the catch, notably, marine turtles and, primarily in the USA, the juvenile stages of fish of interest to the important sport fisheries. In all areas, substantial quantities of demersal finfish are discarded at sea by commercial shrimp trawlers. On-going negotiations between the USA and 14 countries in the region regarding the use of Turtle Excluder Devices (TEDs) on shrimp trawls resulted in agreements with most countries to instal the devices by mid-1994. Shrimp imports to the USA are banned from the other countries.

Total spiny lobster landings in Area 31 increased in 1991 and 1992 after a declining trend since 1985 Figure (F). This is due mainly to increases in landings in the two countries with the highest landings, the Bahamas and Cuba. Lobster landings in Nicaragua have also doubled during the past two years. Landings from the heavily over-exploited US lobster fishery were stable over the last decade but decreased by about 30% in 1992 due to a reduction in fishing effort. With the exception of the Bahamas, most other lobster stocks in the region are heavily exploited. Recent expansions of the fisheries to offshore banks, in particular those between Jamaica and Nicaragua (as for Pedro Bank in Jamaica), are probably sustaining landings, but the status of exploitation of these banks is unknown.

After showing a significant decline in landings over the last eight years due to disease, the American oyster fishery is showing signs of recovery Figure (G). Landings from the US calico scallop fishery continue to be negligible. The large peaks in landings in the past reflect fluctuations in abundance of this bivalve which appear to occur at intervals of several years Figure (H).

Overall landings of conch showed a steady increase through to 1985, then declined and appear to be levelling off (Figure (I). Some unexploited conch stocks probably exist on offshore banks in relatively deep water, 25-30 m. On Pedro Bank, south of Jamaica, where commercial-scale harvesting began in 1990 estimated landings are about 1 800 t, but are not reported. Although many countries prohibit the harvesting of immature conch, enforcement is variable. In most areas, intensive fishing has depleted conch populations to the point of forcing permanent (USA, Mexico, Bermuda) or temporary (Cuba) closure of the fisheries. Stocks in Cuba seemed to recover quickly after a temporary closure of the fishery and stocks in the USA are steadily increasing after many years of fishing closure. In Bermuda, however, in spite of more than ten years of protection, stocks have not recovered from over-fishing. The postulation that there may be spawning reserves of adult conch at depths which are inaccessible to fisheries appears improbable, emphasizing the need to conserve spawning stock-biomass within exploitable depths. Reseeding programmes to rebuild conch stocks have been tried in many countries but have not been demonstrated to enhance fishery yields.

Octopus fisheries occur in only a few locations, most notably on Campêche Bank (Mexico) and in Venezuela, despite a much wider distribution. Landings by Mexico have increased steadily over the period of record, doubling in the past five years to over 16 000 t. Squid landings, primarily by Venezuela, are variable, but continue to increase steadily Figure (J). Reported landings of 2 800 t by the Republic of Korea for the first time in 1992 suggest that the potential for squid fisheries in the region is significant. This resource deserves investigation, for both human consumption and as a bait for large pelagic and sport fisheries.

V. Management Issues

This area offers great contrast in management of fish stocks, from the highly managed US fisheries to the unmanaged fisheries of countries such as Haiti. This partly reflects differences in the relative importance of industrial and artisanal fisheries, but also reflects differences in institutional capability for management among the countries.

The over-exploitation of reef fishery resources on insular and continental shelves has led many countries to emphasize increased exploitation of offshore pelagic resources. Whereas there is potential in pelagic resources, particularly for small island countries, there is also a great deal to be gained by rehabilitation of reef resources, particularly the valuable snappers, lobsters and conch. Given the seasonal nature of most pelagic resources, the development of these fisheries must consider the impact of the new fleets on other resources, particularly demersals, during the off-season for pelagics.

The new emphasis on pelagic fishes, most of which are shared by several countries heightens the need for cooperation in fisheries management, and for wider participation by the countries of the region in international management fora. In the case of demersal resources, countries with isolated shelves could proceed with independent management, but for some stocks larval dispersal and adult migration may still necessitate international cooperation for management.

Destruction of coastal nursery habitats due to tourism and other development are considered to be a major contributory factor in the reduction in landings of reef species, and

continues to be a matter of concern throughout the region. The concept of integrated coastal zone management is currently receiving considerable attention in most countries, but has had measurable impact in only a few.

Investigations on the marine resources of the area fall within the terms of reference of WECAFC, except for tunas, which are covered by ICCAT. The WECAF Commission and its two working parties (on Marine Resources and Economics and Planning) ideally meet in alternate years, as does its Committee for the Development and Management of Fisheries in the Lesser Antilles.

EASTERN CENTRAL ATLANTIC (Area 34) (Table 8)

The total of reported landings for Area 34 for 1992 was down 21% on the 1990 peak of 4.1 million t. Apart from the higher than average landings reported between 1988 and 1991, annual totals varied between 2.5 million t and 3.3 million t throughout the 1970s and 1980s.

This review of the status of stocks has been based on the assessments undertaken by recent *ad hoc* Working Groups on the evaluation of the major fisheries resources in the region, and on the conclusions of the Working Party on Resources Evaluation of the Fishery Commission for the Eastern Central Atlantic (CECAF), Accra, Ghana (10th Session, 10-13 October 1994). Quantitative estimates of potential catches for many stocks have been made by the CECAF *ad hoc* Working Groups (see CECAF/ECAF/SERIES of reports for full details).

I. Northern Areas

The status of most demersal stocks continues as reported in FAO Fisheries Technical Paper No. 335. Total catches of demersal stocks on the Mauritanian continental shelf have decreased from 36 000 t (1984) to 12 800 t (1992), which could reflect a change in fishing strategy (e.g. replacement of target species, increase of discarded fishes, incomplete statistics, etc.). Hakes have been considered moderately exploited while other demersal fish species are more intensively exploited. Quantitative evaluation of many demersal resources has not been undertaken due to the unavailability of required data.

Demersal resources off Senegal are considered slightly over-exploited. The Maximum Sustainable Yield (MSY) for these resources is estimated to be around 130 000 t (1994). Coastal demersal resources off the Gambia are fully or over-exploited with MSY estimated at 15 000 t (1993).

There are two stocks of octopus (*Octopus vulgaris*) targeted by the Northwest African cephalopod fisheries. The more northern of the two stocks, situated off the Saharan coast, is estimated to be able to support a potential MSY catch of 75 000 t. The more southern stock off Cape Blanc, which is considered fully or over-exploited has an estimated MSY of 50 000 t. Catches from the southern stock in 1992 (a total of 44 000 t were landed in Mauritania) have returned to the high levels observed in 1986-87. This recovery is not considered due to fisheries management, but due to a drop in catch rates which caused a 40%

reduction in fishing activities and a decrease in the proportion of juveniles in the catches between 1987 to 1992. Fishing effort reduction concerned only the demersal trawler fleet. The improvement of exploitation patterns was mainly due to the expansion of the artisanal fishery which uses selective fishing gears. The level of exploitation of other species of cephalopods, such as squids and cuttlefish, is lower than that of octopus: their catches account for 15% of the cephalopods landed.

Landings of octopus and associated by-catch species, from the Northwest African cephalopod fisheries have shifted during recent years from Las Palmas to ports in Northwest Africa. Recent management measures taken in Morocco have proved to be beneficial (see FAO Fisheries Technical Paper No. 335). The closed season has been extended from one to two months, in conjunction with the reduction of foreign vessels operating in the area.

The large stock of sardine off Morocco continues at high levels. In 1991, the MSY of the central sardine stock was estimated to be some 550 000 t and the present level of exploitation is considered moderate.

The large stocks of sardine, mackerel and horse mackerel in this region are highly variable, and their assessment difficult. Acoustic surveys carried out off Northwest Africa in 1992 showed that the school density of small pelagics (mainly sardinellas, sardine excluded) was very high, particularly off Mauritania, with biomass estimated at around 4 million t. In addition, the biomass of mackerel and horse mackerel in the area between Morocco and the Bissagos Islands was found to be 830 000 t.

The potential MSY catch of total small pelagic species (sardine excluded) in the zone which extends from Sahara to Senegal was estimated at 1 200 000 t. Until 1992, the different species groups of sardinellas, horse mackerels and mackerels were moderately exploited. The level of exploitation of coastal pelagic resources was low since the decrease of fishing activities of Eastern Europe fleets. The issue is now to compare, within the national context, the profitability of different options for fishing, processing and marketing of catches with the view to identify how national vessels could best replace East European ones.

In the Mauritanian area, pink spiny lobster stocks continue to be heavily exploited. Northern and southern stocks of green lobsters are probably over-exploited. A clam stock (*Venus rosalina*) with a potential of about 300 000 t had been discovered off the coast of Mauritania and is still unexploited for commercial reasons. Stocks of deep-sea crab (*Chaceon maritae*) seem to be reasonably exploited. The present level of catch of deep-sea shrimp (*Parapenaeopsis atlantica*) is around 1 200 to 2 400 t and the state of stocks seems to suggest a possible controlled increase of shrimp fishing activities.

In Cape Verdean waters the most important resources are tunas. Spiny lobsters are now fully exploited and a freeze in fishing effort has been recommended. Updated potential catches of demersal fish are not available. On the whole, the marine fisheries resources in Cape Verde are currently under-exploited.

II. Southern Areas

The continental shelves of Guinea Bissau, Guinea and Sierra Leone are characterized by coastal fish assemblages (*Sciaenid* spp.) principally located in nutrient rich estuarine and inshore areas. Comments made in FAO Fisheries Technical Paper No. 335 on the almost complete disappearance of trigger fish stocks still apply. The exploitation rate applied to cuttlefish stocks has been increasing since 1984 and by 1990 was considered to be equal, or at a level slightly above optimal fishing effort: the rate of growth of these organisms appears faster than previously estimated.

Estimates of the potential of demersal resources of the sub-region described in FAO Fisheries Technical Paper No. 335 have been heavily revised. In Guinea, current estimates based on recent trawl surveys suggest the total biomass of demersal resources to be around 180 000 t, of which 44 000 t are of high or medium commercial value. Assessments made by CECAF in 1991 were updated in 1994 (Working Group held at the Centre national des sciences halieutiques de Boussoura, Conakry, Guinea) and show that total demersal biomass decreased by around 50% between 1991 and 1994. The decrease in biomass of the main demersal species, such as *Pseudotolithus elongatus*, *P. typus*, *Galeoides decadactylus*, and *Drepane africana,* was higher than 50 percent. It was suggested that this change in biomass was related to the recent increase of small-scale artisanal and industrial fishing effort. Interactions with the more commercial large-scale fisheries has led to major problems for the traditional artisanal fishery. Fishery production of the coastal area up to 20 m depth was estimated at about 40 000 t per year.

Trawl surveys carried out on the Guinean continental shelf have shown that between 1985 and 1990 the estimated biomass of coastal resources in waters less than 20 m deep (roughly up to 15 n.mi offshore) declined from 112 000 to 49 000 t during the rainy season and from 72 000 to 48 000 t during the dry season. This reduction between 1985 and 1990 can be explained by the increase in fishing activity of trawlers in inshore areas.

In Sierra Leone, small pelagics species are exploited by the artisanal fishery only. Their current level of catches ranges between 22 000 and 30 000 t. Acoustic surveys have estimated biomass to be between 70 000 and 120 000 t, suggesting controlled development of the industrial sub-sector may be possible. Current annual landings for demersal stocks by trawlers ranged from 8 000 to 20 000 t between 1991 and 1993. Reduced catch rates are currently observed in the fishery and the level of exploitation of demersal fish stock is considered high. MSY has been estimated to lie between 46 500 t and 65 000 t.

Current annual production of shrimp (*Penaeus notialis*) in Sierra Leone was found to fall within the MSY estimate of 2 600 to 3 500 t. Reduced catch rates are currently observed in the fishery and the level of exploitation of shrimp is considered high. In the Gulf of Guinea West and Central, potential catches of shrimps were estimated at 4 700 t and stocks were considered over-exploited. Demersal resources are fully exploited with biomass estimates being between 64 000 and 104 000 t.

Marine resources of the Gulf of Guinea are mainly exploited by Côte d'Ivoire, Ghana, Togo, Benin, Nigeria, Cameroon and Equatorial Guinea, among others. Multi-species fisheries existing in the Gulf of Guinea include:

(i) Small pelagic resources exploited by small-scale gillnets and semi-industrial purse-seine in Côte d'Ivoire, Ghana, Togo and Benin and exclusively by small-scale fisheries in Nigeria and Cameroon.

(ii) Coastal demersal resources which are composed of sciaenids (exploited by small-scale and semi-industrial fisheries in Nigeria, Benin, Togo and Cameroon), groupers and snappers (fished in Togo and Ghana with hooks-and-lines in untrawlable areas), and sparids (Côte d'Ivoire and Ghana).

(iii) Shrimps off Nigeria and Cameroon (white shrimps are fished exclusively by artisanal fishery while pink shrimp is exploited by trawlers of the semi-industrial fishery), penaeids in Togo and Benin and in Côte d'Ivoire (lagoon fishery).

(iv) Offshore demersal resources off Ghana and Côte d'Ivoire (sparids along with the slope community) and off Nigeria and Cameroon (drift fish and red fishes).

The recent biomass estimates of 7 000 t in Congo and 31 000 t in Gabon for stocks of Sciaenidae and Sparidae were based on acoustic surveys carried out in 1994. Demersal resources were either close to full or fully exploited: effort reduction and redistribution would be beneficial because fishing effort has been concentrated on the inshore zone and on juveniles. The small pelagics species (*Sardinella aurita*, *S. maderensis*, *Scomber japonicus* and *Engraulis encrasicolus*) are important unstable resources in the Western Gulf of Guinea (Côte d'Ivoire-Ghana-Togo-Benin) and their stocks are shared. The stock of sardinellas seems to be in good shape. Substantial recruitment of *Sardinella aurita* has been observed in Ghana and Benin in 1988 and 1989. The fishery's pattern in recent years has been different from that of 1985 and 1987, with regard to the availability of the resources. Potential catches of small pelagics (*S. aurita, S. maderensis* and *E. encrasicolus*) in the Gulf of Guinea West and Central have been estimated tentatively at 330 000 t. The stocks are considered fully exploited.

Little is known about pelagic and demersal resources in the whole southern Gulf of Guinea. Many countries have not yet developed the appropriate database and research structure required to analyze the state of exploitation of the stocks.

Acoustic surveys undertaken in the northern shelf of Angola between 1985 and 1994 showed that the biomass of small pelagic resources (*Sardinella aurita, S. maderensis* and *Trachurus trecae*) declined between 1985 and 1989, but that the trend reversed dramatically in the 1990s and that current biomass levels exceed 500 000 t. Horse mackerel (*Trachurus trecae*) biomass was estimated at about 250 000 t (1994). High biomass values for both *Sardinella aurita* and *S. maderensis* were recorded also in the South Gabon - Congo region. The 1994 estimate totalled 135 000 t whereas horse mackerel biomass estimation was 25 000 t. Estimates indicated a considerable increase in biomass as compared to previous survey results, which confirm the trends observed in Angola. Small pelagics stocks are considered under-exploited.

There is evidence suggesting that environmental changes manifesting as periodic variabilities in coastal upwelling intensities have a role in coastal pelagic fish abundance fluctuations (see the Special Topics section on Environmental Issues in Marine Fisheries).

Important initiatives have been taken at a sub-regional level by coastal countries to promote collaborative assessments of shared stocks through working groups and it is the objective of CECAF to promote and support these initiatives as far as possible. On the one hand, and with a few exceptions, most stocks extend beyond the EEZs of coastal countries and are occasionally shared, as in the case of horse mackerel, by as many as seven countries. On the other hand, appropriate management of tropical stocks seems to favour management of species assemblages and communities rather than individual species. These characteristics compound the difficulties of stock assessment and the subsequent adoption and implementation of the management measures necessary for a rational use of the resources.

MEDITERRANEAN AND BLACK SEA (Area 37) (Table 9)

Total landings in the Mediterranean and Black Sea combined increased to a peak of 1.9 to 2.1 million t between 1982 and 1988, but declined to 1.4-1.6 million t respectively in 1990 and 1991, which were mainly due to the collapse of Black Sea stocks of small pelagics, whose landings dropped from 833 000 t in 1988 to 428 0000 t in 1990, and continued to decline in 1991 to 257 000 t.

The Compliance Agreement discussed and agreed to internationally by FAO Member States requires that vessels above a certain size be registered and fly a national flag while operating on the high seas, and this question is currently being addressed by the General Fisheries Council of the Mediterranean (GFCM). In the case of the Mediterranean, the provisions of the Compliance Agreement apply to fisheries beyond territorial seas, and its application is complicated by the small dimensions of many fishing vessels. At least a quarter of the total fishing pressure is exerted by vessels of less than 7-9 t GRT; and more than 70% of the registered catch is taken by vessels at or below 15 t GRT. These figures are probably a significant under-estimate of the importance of small fishing vessels, whose catch and existence are seriously under-estimated in FAO databases.

I. The Black Sea

Black Sea landings of anchovy and other species remain at very low levels, largely as a result of the accidental invasion of ctenophore (*Mnemiopsis leidyi)* mentioned in FAO Fisheries Technical Paper No. 335. New events in the Black Sea include a decline in peak densities of *M. leidyi* swarms from some 5+ kg/m^2 of water column in 1991, to lower figures over the last few years. The species is now well established, however, with seasonal blooms over the period of anchovy reproduction when it consumes fish larvae and zooplankton. In 1992 *M. leidyi* was also recorded in the Marmara Sea and the Turkish Mediterranean. This increases concern that through further transfers in ballast water of shipping, it will spread to other areas of enriched estuarine outflows, both in the Mediterranean (e.g. the Gulf of Lions, Adriatic and Nile estuary) and elsewhere. Preventing its further transfer through this mechanism is currently being addressed through the International Maritime Organization (IMO).

Work has begun towards identification of possible control measures that will allow an economically productive Black Sea ecosystem to be restored, even if the species composition will differ widely from that under the low nutrient conditions prevailing earlier this century. Pollution abatement measures are being pursued through the Global Environmental Fund (GEF), but are not likely to result in a productive ecosystem being restored without human intervention. A list of possible species that feed on jelly predators and could be considered for introduction by a new Black Sea Fishery Commission (presently being reconstituted), is being prepared by the Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), with emphasis in commercially valuable fish such as salmonids and cod. Work also proceeds on the development of a new Convention for Black Sea fisheries and a Fishery Commission with full coastal State Membership. This will have to cover new questions, such as the possible status of sea ranching to ensure that juvenile fish raised in hatcheries to avoid predation by *M. leidyi* are harvested in such a way that these countries concerned recover their investment.

II. The Mediterranean

Despite a long history of biological investigation, it is only relatively recently that research has been carried out specifically in support of management of fish populations. Now rapid progress is being made, largely as a result of the sub-regional Expert Consultations of the General Fisheries Council for the Mediterranean on stock assessment.

During the second world war, stocks in the northern Mediterranean, heavily fished before the war (as for the better documented North Sea), recovered due to a reduction of fishing pressure during the period of hostilities. The subsequent depletion of shelf resources occurred very quickly however: thus mullet (*Mullus barbatus)* catch per day dropped after the war from 75 kg in 1943, to just over 10 kg after 1952, and in the 1960s fell even below this. Circumstantial evidence after several years of virtual cessation of fishing in the eastern Adriatic caused by the civil war in the former Republic of Yugoslavia, suggests that some stock recovery and more abundant and larger hake were caught in 1993 in the eastern Adriatic.

In some respects the situation is similar to the 1950s except that fleets are larger, and the fishing technology vastly superior. With a few exceptions, any fishing vessel can fish beyond 12 miles from the coast, and do so largely without restriction. Most fisheries are by Mediterranean States, with the exception of distant-water fleets that principally exploit tunas, and whose activities are described later in this report. Only recently concern about over-fishing is being translated into management action, with the proposed transformation of GFCM into a management body that takes effective action, particularly in the control of fishing effort.

A categorization of Mediterranean shelves

The shelf and slope habitat of the exploitable demersal populations is narrow, and except for deep-water resources such as royal red shrimp, large hake, red coral, most of the fisheries are fairly close to shore. Unlike most other seas, jurisdiction beyond territorial seas (varying from 6 to 30 n.mi from the coast) has not been declared. From Figure 2 which is a GIS map showing a scale of 12 miles from the coast in relation to a 200 m isobath, it is

Figure 2. **Plotting a line 12 miles offshore using GIS technology in relation to the 200 m isobath, reveals areas where straddling stock management must apply to demersal fish.**

clear from the point of view of management jurisdiction, that Mediterranean resources form two categories; those of:

1) *Extensive trawlable shelves:* There are several extensive areas within the 200 m isobath, Gulf of Gabes, Catalonia Shelf, Gulf of Lions, and the Adriatic Sea, where trawling is the key fishing method for demersals. Since these areas fall partly inside and partly outside territorial seas, their resources are straddling as well as (where more than one coastal State is involved), shared, resources. Their management is currently being discussed in New York by the UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks.

2) *Fringing shelves within national jurisdictions:* the rest of the Mediterranean shelf forms a narrow fringe largely within territorial seas. Some of this is trawlable (e.g. along the coasts of Syria and Israel), but much is dominated by untrawlable bottom (e.g. along the Algerian littoral), and fished by small-scale vessels with a wide variety of fishing gears. In these areas fisheries fall under national jurisdiction.

II.1 The Western Mediterranean

II.1.1 Division 37.1.1 Balearic

This is an area of relatively high productivity where the Atlantic inflow upwells in the Alboran Gyre and along the Algerian coast, and is associated with significant small pelagic stocks. The Mediterranean inflow is progressively less enriched as it moves east and north past Sardinia, Corsica and the Baleares, where lobster and red coral are associated with deep-water rocky bioecoenoses. The Catalan coast is relatively productive due to land runoff and local upwellings. The production per shelf area is among the highest in the Mediterranean at some 5 t/km^2.

Characteristics of the fleets and gears

Mainly trawlers, but also purse-seiners predominate in this region, also by volume and value of catches. Apart from these "industrial" fleets, a well-developed small-scale fishery takes a significant but imprecisely known proportion of catches using many types of fishing gears. Algeria, Morocco, and to a lesser extent France, have shown significant rises in industrial fleet size in the 1970s and 1980s, although for the latter two countries, a considerable proportion of vessels (as for Spain where fleet size has remained stable), operate outside the Mediterranean.

Moroccan fisheries are dominated by small pelagic fisheries, but a few trawlers and many "petit metier" vessels exploit the narrow shelf area. Along the Algerian coast seining for small pelagics predominates with some midwater trawling, and small-scale boats operate over rocky areas for a predominantly demersal and large pelagic species. Fleet capacity has been growing at some 7 500 GRT per year over the past years, and trawlers compete heavily on the narrow (and overfished) trawlable areas.

In Spain the fleet size and fishing effort is limited by an operational fleet census and licensing system, but a migration of purse-seiners from southern to northern Mediterranean

coasts has been observed over the last few years caused by the drop in anchovy catch in the Alboran Sea. Increasing competition from bottom trawlers catching anchovy has been observed over the last years in some regions such as Catalonia.

State of exploitation and assessment

Assessments have been reported at GFCM and other regional fisheries bodies for most of the resources in the table below, including direct trawl, acoustic, and egg and larval surveys, and estimates based on catch sampling for size-and-age data. Time series of commercial catch-and-effort data are also available for a few species, and some production model estimates have been made. The assessments suggest that the demersal stocks are fully or overexploited throughout the region, and some fishing effort has been diverted to deep water slope areas in search of large hake and royal red shrimp.

Table A. Key species in Division 37.1.1 Balearic; with a tentative estimate of their state of evaluation.

SPECIES	*1991 LANDINGS (mt)*	*TREND 1972 to 1991*	*BIOLOGICAL STUDIES*	*VESSEL SURVEYS*	*ASSESSMENT PERFORMED ?*
Sardine	*109 250*	*rising*	*yes*	*acoustic*	*yes*
Anchovy	*20 912*	*stable*	*yes*	*acoustic*	*yes*
Hake	*4 509*	*rising*	*yes*	*trawl*	*yes*
Red mullet	*3 548*	*stable*	*yes*	*trawl*	*yes*
Red shrimp	*1 905*	*rising*	*yes*	*trawl*	*yes*
Octopus	*5 679*	*rising*	*yes*		
Cuttlefish	*1 211*	*declining*	*yes*		

At least in the northern part of the Division a lack of fishing pressure on sardine is probably due to low market demand, and an increase in the biomass has been observed. There has been an intensification of exploitation of anchovy which has shown a decline. In general, the fisheries of this region has shown moderate increases in landings, with production per shelf area among the highest in the Mediterranean Sea.

II.1.2 Division 37.1.2 Gulf of Lions

The western Division is characterized by a trawlable continental shelf 45 miles wide; the eastern part is characterized by a rocky, narrow continental shelf. This coast is characterized by productive lagoons and is dominated by the Rhone outflow: a biologically-productive environment as reflected in the important shellfish culture activities of the sub-region. Fishery production was some 6.5 t/km^2 in 1989.

Characteristics of the fisheries and gears

The Spanish and French industrial fleets, mainly trawlers, but also purse-seiners, longliners and gillnetters, reached approximately their present size at least a decade ago, and

despite a limitation on the number of licences, and small or even negative rates of increase in fleet size, fishing power continues to grow as technical innovations are introduced. The use of high-opening trawls by French fishermen results in a significant proportion of small pelagics supplementing a rather low net catch rate for demersals by this gear. A diversified small-scale fleet harvests a range of resources with a variety of gears, including tangling and trammel nets, traps and dredges; both inshore, and in an extensive system of coastal lagoons where aquaculture operations are well developed.

Table B. Key species in Division 37.1.2 Gulf of Lions

SPECIES	*1991 LANDINGS (mt)*	*TREND 1972 to 1991*	*BIOLOGICAL STUDIES*	*VESSEL SURVEYS*	*ASSESSMENT PERFORMED?*
Sardine	*15 203*	*rising*	*yes*	*acoustic*	*yes*
Anchovy	*10 660*	*rising*	*yes*	*acoustic*	*yes*
Hake	*3 896*	*rising*	*yes*	*trawl*	*yes*
Mullets	*2 201*	*rising*	*yes*	*trawl*	*yes?*
Eel	*1 201*	*Stable*	*yes?*	*no*	
Sole	*442*	*rising*	*yes*	*yes*	*yes*
Mussel	*16 148*	*stable*	*culture*	*no*	
Oyster	*10 014*	*rising*	*culture*	*no*	

State of exploitation and assessment

A multi-species global analysis of the trawl fishery suggested that MSY conditions had been passed in 1991 for most demersals. This preliminary analysis has been confirmed during the recent EC-sponsored "FARWEST" stock assessment programme by analytical methods on key species.

II.1.3 Division 37.1.3 Sardinia

This zone is characterized by water masses of generally low productivity, and narrow shelves with irregular sea-beds and steep slopes. A high diversity of fauna occurs on predominantly rocky bottoms with red coral biocoenoses, palinurid lobster and sparid stocks, and relatively low productivity, mainly of small pelagic fish, of 1.4 t/km^2: the only Division where landings have declined over the last two decades.

Characteristics of fleets and gears

The Italian fleet predominates in this sub-zone: some 65% of the Italian fleet here operating in the Tyrrhenian Sea. For the small-scale fleet, boats of less than 10 GRT and 100 HP, represent more than 75% (and in Sardinia practically all) of the fleet, by number of vessels.

State of exploitation and assessment

A number of demersal resources have been assessed in the Ligurian and Tyrrhenian Seas, predominantly by trawl survey and analytical techniques. These suggest that stocks of mullet, hake, Norway lobster, blue whiting, red shrimp and royal red shrimp, are fully to over-fished. Inshore fishery resources of the rocky northern Tunisian coast are fished by small-scale vessels, and are considered to be somewhat under-exploited.

Table C. Key species in Division 37.1.3 Sardinia

SPECIES	*1991 LANDINGS (mt)*	*TREND 1972-1991*	*BIOLOGICAL STUDIES*	*VESSEL SURVEYS*	*ASSESSMENT PERFORMED?*
Sardine	*4 520*	*declining*	*yes*	*yes*	*no?*
Anchovy	*2 619*	*declining*	*yes?*	*yes*	*no?*
Hake	*2 690*	*declining*	*yes*	*yes*	*yes*
Dentex	*1 069*	*rising*	*yes?*	*yes*	*no*
Sole	*1 030*	*rising*	*yes?*	*yes*	*no*
Mussel	*15 928*	*rising*	*culture*		
Octopus	*2 390*	*stable*			

II.2 The Central Mediterranean

Fleet sizes registered here showed rises of some 5% per year for industrial-scale boats in the 1970s and 1980s for the former Yugoslavian Republic and Tunisia, and slight reductions for Italy. Fleet renovation has been underway recently for Albania, Croatia and Libya.

II.2.1 Division 37.2.1 Adriatic

An extremely productive and extensive area of trawlable bottom of mud and sand is subject to strong nutrient outflow from incoming rivers, and from agricultural/industrial and dense coastal populations, as well as receiving nutrient inflows of an apparently periodic nature from the Mediterranean proper. This combination occasionally leads to eutrophic conditions and anoxic die-offs of demersal and benthic resources in the northern and western Adriatic, and is conducive to high productivity of molluscan shellfish, including vongole (clams), mussels, scallops and a variety of small commercial invertebrates and fish of high unit value. A rise in production of demersal and pelagics per shelf area to 2.81 t/km^2 had occurred by 1989.

Characteristics of fleets and gears

This Division is exploited by a multi-gear fishery of trawl, gillnet and seine fisheries, and supports a hydraulic dredge fishery for "vongole". The Italian trawl fleet fishing the Adriatic in 1986 made up 46% of all Italian vessels - close to 3 000 units. This includes in

the 1980s a specialized fleet of pelagic pair trawlers which have progressively replaced the purse-seine fleet. Albanian fisheries have been mainly sardine, but following recent political upheavals, fishery reconstruction in Albania is underway. A new fleet of vongole dredges was introduced in 1986 with signs of over-exploitation already evident in 1993.

State of exploitation and assessment

Assessments of demersal fish have been carried out using trawl surveys and length-based analytical techniques. These analyses confirm that in the late 1980s, the demersal resources (notably red mullet and hake, but also other demersals) were fully to over-fished. The closed season introduced by Italy, and the significant cutback in fishing effort in the eastern Adriatic due to the war of the former Yugoslavia, appear to have had some influence on increased recruitment or survival of juvenile hake and mullet, although the precise impact and relative influence of these two factors is not analyzed.

The "vongole" (clam) fishery is, or was, the single most valuable fishery in the Mediterranean in terms of landed values, but in recent years has suffered collapses of the key species (*Venus chione*), apparently due to overfishing.

Table D. Key species in Division 37.2.1 Adriatic

SPECIES	*1991 LANDINGS (mt)*	*TREND 1972-1991*	*BIOLOGICAL STUDIES*	*VESSEL SURVEYS*	*ASSESSMENT PERFORMED ?*
Sardine	*44 512*	*rising*	*yes*	*acoustic*	*yes*
Anchovy	*13 076*	*declining*	*yes*	*acoustic*	*yes*
Hake	*4 105*	*stable*	*yes*	*trawl*	*yes*
Mullet	*3 802*	*declining*	*yes*	*trawl*	*yes*
Norway lobster	*2 024*	*rising*	*yes*	*trawl*	*yes*
Mussel	*52 559*	*rising*	*culture*		
Striped venus	*25 419*	*(stable?)*	*yes*	*dredge+ diver*	*yes*
Clams nei	*16 000*	*sharp rise*	*yes*	*"*	

II.2.2 Division 37.2.2 Ionian

The shelf areas off Tunisia are the largest and most productive of the Mediterranean after the Adriatic, varying from rocky areas in the north to trawlable sand and mud bottom in the south; otherwise, this area is generally low to moderate in productivity, especially along the southern littoral. The fish production per shelf area in this Division has more than doubled in two decades to 1.43 t/km^2.

The characteristics of vessels and gears

The shelf areas off Sicily, and more importantly off Tunisia, support an important trawl

fishery by fleets from both northern and southern Mediterranean countries: the latter, predominantly industrial-scale Italian vessels, also heavily exploits trawlable grounds in the Sicily Channel. In the northern shelf waters of Tunisia, exploitation of demersals by multi-purpose vessels is believed to be at below MSY levels, but the intensive fishery in the southern waters of the Gulf of Gabes by trawling and a variety of other methodologies is clearly over-exploiting key resources.

Table E. Key species in Division 37.2.2 Ionian

SPECIES	*1991 LANDINGS (mt)*	*TREND 1972-1991*	*BIOLOGICAL STUDIES*	*VESSEL SURVEYS*	*ASSESSMENT PERFORMED?*
Sardine	*19 854*	*rising*	*yes*	*acoustic*	*Yes*
Sardinellas	*15 364*	*rising*	*yes?*	*acoustic*	*?*
Trachurus	*6 116*	*rising*	*yes*	*acoustic*	*?*
Red mullet	*6 209*	*stable*	*yes*	*trawl*	*yes*
Sole	*4 232*	*rising*	*yes*	*trawl*	*yes?*
Shrimps	*18 084*	*rising*	*yes*	*trawl*	*yes*
Mussels	*32 069*	*rising*	*yes?*	*culture*	
Cuttlefish	*8 671*	*rising*	*yes?*		
Octopus	*8 671*	*rising*	*yes?*		

The state of exploitation and assessment

Stocks of pelagics in the northern Ionian Sea are smaller than in more productive Adriatic waters, but anchovy catches of 3 500 t are still about 40% of biomass levels. Off northern Tunisia, an earlier acoustic estimate of 47 000 t (dominated by sardine, mackerel and horse mackerel) which well exceeded landings of some 8 300 t in 1993, may have been an over-estimate. Lack of year-round access to the resource, rather than a low exploitation rate, plus problems of marketing seasonal gluts, may be the key problems. In the more productive Gulf of Gabes, pelagic biomass was estimated at some 90 000 t; with equal dominance by sardines and sardinellas, and again, the contrast with 1987 catches of 23 000 t from this region, suggests some limited room for pelagic fishery expansion.

Demersal fisheries in Tunisian waters are aimed at high value shrimp, lobster and cuttlefish stocks in the south, where three quarters of the trawl fleet operates. Intense trawling effort in the Gulf of Gabes is aimed at shrimp (*Penaeus kerathurus*), but catches dropped from 102 000 t in 1988 to 83 000 t in 1993. From production modelling, levels of effort corresponding to MSY were passed in 1988 by some 20%. This has led to social conflicts, over-exploitation, and impacts on inshore *Posidonia* biocoenoses. Attempts are made to divert effort towards less easily trawlable grounds off northern Tunisia, where some slight increases in demersal effort could be supported.

Significant growth in effort on clams (*Tapes decussatus*) doubled production between 1979 and 1993 as new grounds continued to be found. Resources of red coral occur to the

north, and in the Gulf the sponge *Hippospongia communis* is exploited by divers and trawling, but has shown dramatic collapses (as has the rest of the Mediterranean sponge stocks) due to an epidemic; with some recent evidence of recovery.

State of resource assessment

Emphasis continues to be placed in the northern Ionian and Sicily Channel on trawl surveys of demersal stocks, and egg and larval/hydroacoustic surveys of small pelagics. These estimates suggest full to over-exploitation for demersal resources such as hake and red mullet. In southern waters, production models and perform yield-per-recruit estimations confirm this situation for demersal and shrimp resources.

II.3 The Eastern Mediterranean

In this Sub-Region, FAO fleet statistics also showed significant rates of industrial fleet growth in the 1970s and 1980s, averaging 5% per year for Egypt, Greece, Israel and Turkey, and stable, low fleet sizes elsewhere.

II.3.1 Division 37.3.1 Aegean

This is an area with complex bathymetry, many small islands, and narrow shelves, except in the north and west. It was formerly considered an area of low biological productivity but has shown notable increases, especially in the north and west: the area is under the influence of low productivity Mediterranean inflows along the Turkish coast, and enriched Black Sea inflows south along the Greek mainland in the north and west, plus nutrient inputs from incoming rivers. The overall fishery production in 1989 was 2.2 t/km^2 shelf, almost eight times that registered in 1969. Together with increases in fleet power, we may postulate that environmental change played a role in the increased production from this area.

Table F. Key species in Division 37.3.1 Aegean

SPECIES	*1991 LANDINGS (mt)*	*TREND 1972-91*	*BIOLOGICAL STUDIES*	*VESSEL SURVEYS*	*ASSESSMENT PERFORMED?*
Sardine	*25 635*	*rising*	*yes*	*acoustic*	*yes?*
Anchovy	*17 422*	*rising*	*yes*	*acoustic*	*yes?*
Bogue	*10 896*	*rising*	*yes*		
Picarels	*9 708*	*stable*	*yes*		
Chub mackerels	*8 059*	*rising*			
Hake	*4 045*	*sharp rise*	*yes*	*trawl?*	*yes*
Grey mullet	*2 844*	*"*	*yes?*		
Red mullet	*2 703*	*rising*	*yes?*	*trawl?*	*yes?*
Blue whiting	*2 222*	*stable*	*yes*	*trawl?*	*yes?*
Norway lobster	*1 257*	*sharp rise*	*yes?*		
European oyster	*2 190*	*"*	*culture*		

The characteristics of fleets and gear

Turkish Aegean fisheries are dominated (78%) by small-scale vessels, most of the rest being purse-seiners. No more than 20% of Turkish catches come from the Aegean, but some 90% of total Greek catches are caught here. The Greek fleet is dominated by 20 000 small vessels operated by sports and commercial fishermen, with the latter predominating in recent years; this probably leading to increases in fishing pressure. Gillnets, trammel nets, traps, bottom longlines and small towed gear are commonly used. Beach-seiners with mesh size of 16 mm are banned from operating in the summer and at night. There is also a fleet of small trawlers and seiners: trawlers use a mesh size of 28 mm stretched mesh in the codends.

State of exploitation and assessment

Anchovy makes up much of the value of Greek landings from the northern Aegean; fished by purse-seiners and midwater trawlers whose increase in fishing power in the 1970s and 1980s outstripped the increases in landings noted in those years. Stock declines have occurred in recent years despite an exploitation rate of some 30% judged from acoustic biomass estimates. Hydroacoustic surveys in recent years throughout Greek waters reveal that fish biomass is largely concentrated in the enriched waters along the Greek mainland.

The hake stock in the northern Aegean has shown significant rises in landings recently. Yield-per-recruit analyses have been carried out in Greek waters for key species such as red mullet and hake. For demersals, exploitation rates are generally high. A production model fitted to *Mullus* fisheries suggests the need for effort regulation is most urgent in the northern sub-areas of the Aegean. High production of *Mullus* species seems associated with the eutrophic conditions here. Bottom trawl surveys and analyses of size compositions in the 1980s, suggested high values of exploitation for red pandora, except in the middle Aegean where part of this area is closed to trawling.

Biological investigations have predominated in Turkish investigations on growth, maturity and fecundity of key species such as sole, and biomass trawl surveys were conducted off local areas.

II.3.2 Division 37.3.2: Levant

This Division is characterized by a narrow shelf and a low level of biological productivity due to the depletion of nutrients in water which originally entered the Mediterranean from the Atlantic inflow; demersal stocks are small and small pelagic resources are generally not abundant, except in localized areas. Overall fish production per-shelf-area of 1.6 t/km^2 in 1989 has nonetheless tripled over two decades.

Formerly the River Nile provided seasonal inflows of sediment and nutrients. This was drastically reduced after the construction of the Aswan Dam, with immediate impacts on the small pelagic resources whose landings dropped significantly. Some recovery of these resources appears associated with high nutrient outflows of drainage water from the Nile Delta.

The characteristics of fleets and gear

Fleets are numerically dominated by small-scale vessels, except for Egypt and Turkey where some larger vessels operate. The largest fleets in the Division are from Egypt and Turkey, and both countries fish other areas (Egypt, the Red Sea, and Turkey, the Aegean, Marmara and Black Seas). The Egyptian small-scale fleet is 50% powered by sail and oars; many boats operate with engines of less than 50 HP. The trawlers are also reported to be largely lowpowered: only four boats are over 400 HP. There is also a small fleet of seiners. Cyprus, Israel, Lebanon and Syria have small fleets with a few medium-sized trawlers. As for other areas, the small-scale fleet operate a wide range of gears. A significant part of the large artisanal catch in Egypt comes from the highly nutrified coastal lagoons. In Israel, a small fleet of mini-trawlers exploit shrimp and groundfish stocks inshore. Exotic species of shrimp and finfish entering from the Red Sea appear first in the Israeli fishery before moving westwards and northwards into the rest of the Mediterranean.

Table G. Key species in Division 37.3.2: Levant

SPECIES	1992 LANDINGS (mt)	TREND 1990-1992	BIOLOGICAL STUDIES	VESSEL SURVEYS	ASSESSMENT PERFORMED?
Sardinella	9 701	rising	?	?	?
Silverside	5 272	sharp rise	?	?	?
Sardine	4 747	rising	?	?	?
Lizardfish	1 487	rising	yes?	?	exotic
Gilthead seabream	1 432	stable	yes	?	?some culture
Shrimps	4 507	rising	yes?	?	?

Roughly 50% of Egyptian landings come from the Mediterranean, and a great proportion from coastal lagoons. Catches from the Mediterranean have recovered from 6 000 t to 24 000 t since 1975: almost to the pre-Aswan level, and landings are dominated by small pelagics. In Turkey, roughly 12% of the national fleet habitually fish this region, and is dominated (roughly 80% by number) by small-scale vessels; the remainder divided fairly equally between trawlers and purse-seiners.

Cyprus has a small fleet with a small trawler fleet subject to regulations that reduce conflict with the small-scale fleet, and has made strong progress towards assessing the demersal resources. These are mainly the picarel (*Spicara smaris*), and bogue (*Boops boops*), red and striped mullet and red pandora. Yield-per-recruit and age cohort analyses have been performed which show a generally overfished condition, and predict benefits for mesh size increase and strong effort reduction. The latter measure was discounted as unfeasible since picarel, the most important species, has a body dimension that would not be retained by larger meshes.

State of exploitation and assessment

The main small pelagic fishery is off the Nile Delta, formerly dominated by sardines, and now by sardinella and other species. Some 30% of Turkish catches in 1987 were small pelagics, predominantly sardines and mackerel.

Sparidae and Mullidae are dominant in the demersal catch, and small shrimp fisheries operate in the region. In Cyprus, proposals to reduce fishing intensity inshore include promoting fishing offshore during a long closed season inside territorial waters, except during the winter months when recruitment is not occurring inshore. In Turkey, some 11% of the catches are molluscs but, throughout the sub-region, shrimp and cuttlefish are the most important invertebrates.

II.4 Management Measures

The demersal and shellfish resources

The Mediterranean demersal resources, and the resources for anchovy, are subject to very high fishing pressure along most continental shelves, and are highly dependent on favourable recruitment. If good recruitment is impacted by over-fishing or adverse environmental changes, stocks may abruptly decline.

Relatively few countries have taken management action to control fishing effort, and fleet size has continued to rise over the last two decades. Allowing for changes in fishing power, catch rates of demersals in inshore fisheries are still generally low, and present landings are maintained by exerting a high fishing effort by over-capitalized fleets. Management action on effort is the key to success in increasing the yield and, more certainly, the economic return. Effort control is a precondition to the success of other management measures, such as increasing the size at first capture, the spawning biomass and spawning success. Urgent measures also need to be taken to protect inshore nursery areas from impacts of fishing and pollution.

As far back as 1954, GFCM recommended seasonal inshore closures at the time of the recruitment of young-of-the-year. This measure has been applied in Cyprus since the mid-1980s and has improved recruitment to the fishery and in 1988-89 had apparently a similar effect in Italian waters. Without limited access, a seasonal closure inshore appears capable of producing increases in yield, and has comparable effects on mesh size regulation. Such a result can be achieved by improved surveillance but, protecting against inshore trawling on sensitive areas such as *Posidonia* beds, areas of rocky outcrop and nursery grounds, by installing passive devices to snag trawls, may be a more cost effective approach. This can be combined with the technology of artificial reefs used for fish aggregation, aquaculture, etc.

The small pelagic fish

For small pelagic fish, management measures to control fishing have been relatively limited, apart from restrictions on pelagic trawling in some countries. Few stock assessment recommendations have been made, except for the Gulf of Lions stock of sardines. The

problem for most small pelagic fish, except anchovy, is related to difficulties in achieving effective utilization and marketing rather than overfishing. Large-scale fluctuations in stock-size continue to occur for small pelagic fish (and to a lesser extent for demersals) which are as yet unexplained by science. From the general similarity of such changes in many areas, it is presumed that they are environmentally driven, although the decline of anchovy in may areas (Figure 3) may suggest that this highly sought species is also subject to excessive fishing. There is evidence that the productivity of some small pelagics, notably sardine, as for some demersal fish, may have increased in various areas in recent years (Figure 3). As noted in FAO Fisheries Technical Paper No. 335, this may be a result of moderate levels of nutrient enrichment, but could be due to other environmental changes. All that can be suggested is that except for anchovy, management of small pelagic stocks in most areas is not as high a priority as it is for demersals, and in fact the management action appropriate in some areas would be to provide for some substitution of unsatisfied demand for demersal stocks.

SOUTHWEST ATLANTIC (Area 41) (Table 10)

To a greater extent, the fluctuations in the total catches of certain species or groups of species can be considered to be within the normal limits prevalent since 1987. No major changes in the general trends reported in FAO Fisheries Technical Paper No. 335 have been observed and the situation can be considered relatively stable.

Total landings of Argentinean hake (*Merluccius hubbsi*) increased from 421 000 t in 1990 to 521 000 t in 1991, and then decreased to 455 000 t in 1992. This increase with respect to previous years has been primarily due to an increase in catches by Argentinean and Uruguayan fleets, mostly as a result of an increase, more particularly in the availability, of the stock in the traditional fishing grounds. These are mostly located in the common Argentinean-Uruguayan fishing zone, but some active fishing also goes on further south.

Landings of sardinella (*Sardinella brasiliensis*) increased slightly to a total of 65 000 t in 1991-92, but are still far below the figure of more than 100 000 t per year reached in the 1970s and early 1980s. Although this might be a sign of recovery with respect to 1990, when total catches dropped to only 32 000 t, the stocks continue to be in poor condition.

Catches of squids increased consistently with respect to 1990, but are of the same order of magnitude at 700 000 t per year, as in the mid 1980s. Some improvements have been made with respect to the management of these squid stocks, particularly in the Falklands (Malvinas) area, where joint efforts are made to regulate the active offshore international fisheries that have developed in this area over the years. The situation for other groups of species has remained unchanged with respect to what was reported two years ago in the previous review of this Circular, and last year in FAO Fisheries Technical Paper No. 335.

SOUTHEAST ATLANTIC (Area 47) (Table 11)

Following the effective cessation of distant water fishing in 1990 in the EEZs of the then newly independent Namibia, and with increasing awareness of fisheries development

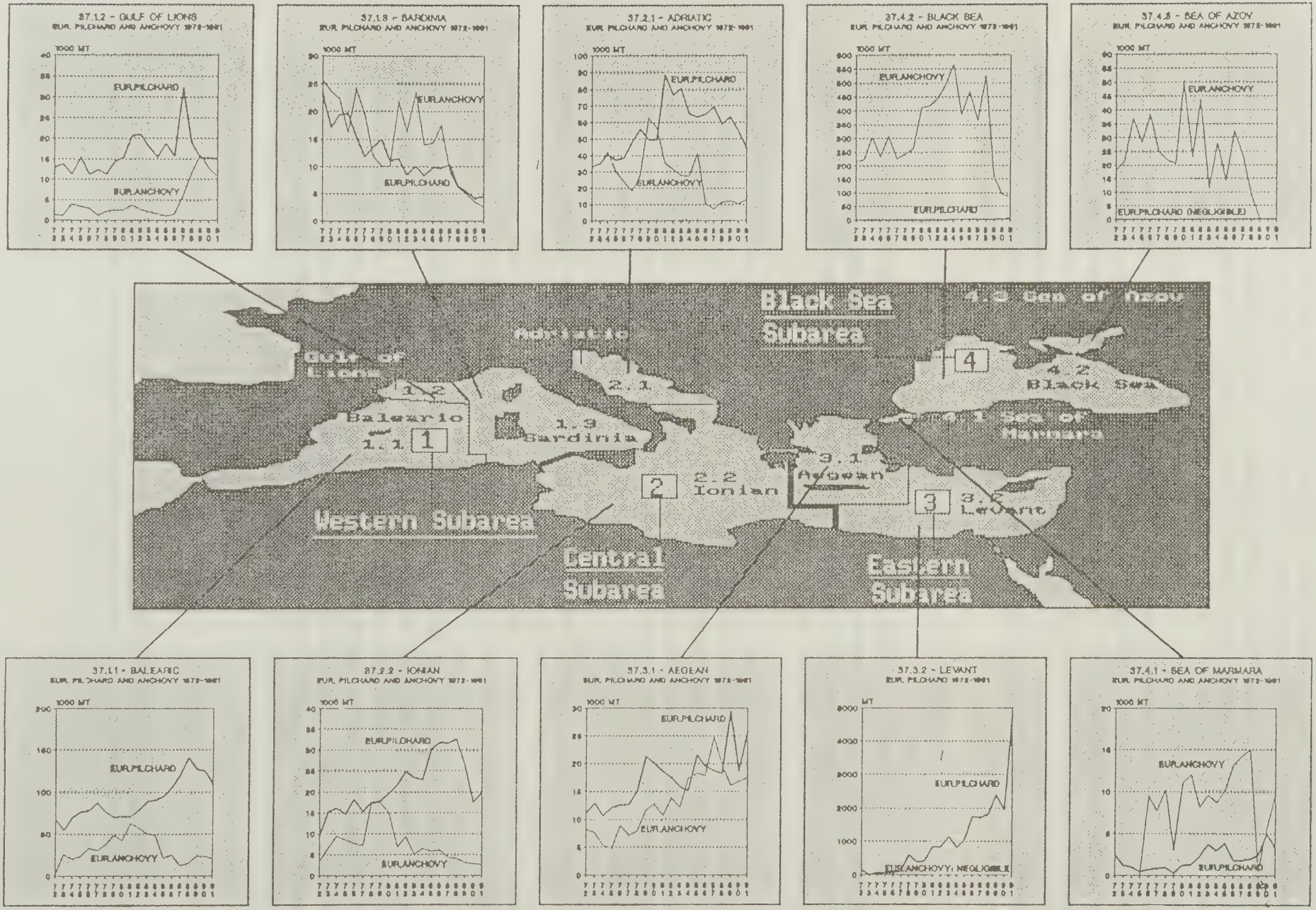


Figure 3. Trends of anchovy and sardine landings since 1972 (from Stamatopoulos 1993 - FAO Fisheries Circular No. 855:4)

in Angola (see FAO Fisheries Technical Paper No. 335), total reported landings between 1990 and 1992 in this highly productive area remained relatively constant at approximately 50% below the average 2.7 million t per year taken in the 1970s and 1980s. Fishing rights in Namibia's EEZ granted largely to South Africa in 1987, elapsed at the end of 1993. Since then the renewed development of fisheries in the EEZ of Namibia has been designed to maximize benefits to Namibia while remaining within the terms of the United Nations Convention on the Law of the Sea (UNCLOS III). The setting of total allowable catches (TACs) and the allocation of quotas are major issues for Namibia, with the aim to restrict catches in such a way as to allow the biomass of stocks to increase (for instance, the TAC for hake was set at 115 000 t in 1993).

While the relatively few species that accounted for both the major share of biomass and catches in the area (see FAO Fisheries Technical Paper No. 335) continue to dominate, there have been some changes of note between 1990 and 1992, notably, the increase in landings of Southern African anchovy (up 186 000 t, or 92%) and the decline in catches of Cape hake in the former International Commission for the South-East Atlantic Fisheries (ICSEAF) sub-areas 1.3 to 1.5 (down 88 000 t, or 88%). Total landings of the two species of hakes (see FAO Fisheries Technical Paper No. 335) from all of Area 47 dropped by 60 000 t (22%). All the hake stocks have been over-exploited, although the most southerly stocks seem to show some sign of recovery. Landings in 1991 and 1992 were 183 000 t and 208 000 t respectively.

The Cape horse mackerel stock is currently considered in a healthy state and the policy is to maintain fishing at a high level. A TAC of 450 000 t was maintained for the past three years. Purse-seining of horse mackerel in offshore areas is encouraged because the risk of taking pilchard as by-catch is thus diminished. Midwater trawling is restricted to a water depth greater than 200 m to minimize pilchard and hake by-catches.

The anchovy stock is less valuable than pilchard and used mainly for fish meal production. Exploited almost entirely by coastal South African fleets, the anchovy stock yielded almost 373 000 t in 1989 and was considered to be fully exploited. Landings totalling 386 000 t were reported for 1992.

Landings of miscellaneous sardinella species were reported only by Angola in 1992. Landings had been made predominantly by the former USSR up until 1990, and by the Russian Federation, Estonia, Latvia and Lithuania in 1991. Total landings for this group of species were down 74% on the 1990 figure.

Landings from the heavily exploited Cunene horse mackerel, chub mackerel and Southern African pilchard stocks continued to decline. The high biomass of round herring (*Etrumeus whiteheadi*) reported towards the end of 1989 (see FAO Fisheries Technical Paper No. 335) failed to translate into significantly increased landings.

WESTERN INDIAN OCEAN (Area 51) (Table 12)

The total recorded landings for the area in 1992 were up 12% compared to 1990; reaching 3.7 million t. Of this increase, 25% can be attributed to the rise in reported

landings of skipjack and yellowfin tuna by predominantly distant-water fishing nations. Further data and information regarding the status of oceanic tuna stocks are given in Table 21 and the Special Topics section on Tuna and tuna-like species.

I. Northern Areas

The increase in reported fish landings between 1990 and 1992 of India, the Islamic Republic of Iran, and Pakistan, together constituted nearly 50% of the increase in landings for the entire Western Indian Ocean. The increases in Indian landings to 1990, noted in FAO Fisheries Technical Paper No. 335, were attributed principally to pelagic species. However, virtually all Indian catches of identified pelagic species decreased between 1990 and 1992. The predominant causes for the increase were due to increased catches of Pompanos (*Trachinotus* spp.), miscellaneous Carangids and Bombay duck, as well as a growing volume of unidentified species. Similarly, for Iran, the species making up the increase in landings between 1990 and 1992 are unidentified. For Pakistan, the increase came chiefly from yellowfin tuna and Indian oil sardine.

No major changes in the resources of the Red Sea have occurred. With the advent of independence for Eritrea, renewed emphasis has been placed on development of this country's fisheries. However, the long war has resulted in a low level of fishing capability because of destruction and lack of maintenance of existing vessels and related infrastructure. At present, fishing agreements are being negotiated with a number of countries who seek access for their vessels to Eritrean waters. Up to 40 licences have been issued in 1994.

The main development of interest in the marine resources of the Persian Gulf has been the recovery of the marine habitat from the effects of the 1991 "Gulf war"; notably the effects of the quantities of enormous combustion of crude oil in Kuwait. In 1991 Saudi Arabian shrimp landings fell markedly, with a very low proportion of sexually-mature adults. By 1992 a cohort abundance index for adults and juveniles was about 1.5 compared with 195 and 205 for 1989 and 1990 respectively; a massive reduction. The spawning biomass fell to about 1.8% of the pre-war level, a decline capable of causing a recruitment collapse. Landings fell from about 4 000 t in 1989 to about 25 t in 1992. It has been concluded that because of the lack of detailed biological knowledge about *Penaeus semisulcatus* in the Persian Gulf it is impossible to identify the exact manner by which the shrimp stocks were affected, though events associated with the war appear to have been a factor in the collapse.

Zooplankton samples collected at known spawning sites of shrimp on the Saudi coast in April 1992 showed that at one site, Ras Tanura, the mean penaeid larval abundance was significantly lower in 1992 compared to that obtained during the same period in the 1970s whereas the mean abundance of zooplankton was no different. At a second site, Safaniya, both zooplankton and penaeid larval abundance was much lower than when formerly sampled.

In the Arabian Sea area, concern exists in Oman about trends in the important Spanish mackerel (*Scomberomorus commerson*) fishery. Studies over the last years have shown that the average size of the fish taken has been decreasing and now 70-80% of the catch are of a very small size. While growth-overfishing is clearly occurring, there is also a danger that future recruitment will be reduced as the fishery turns to smaller and smaller individuals.

These fish migrate through the waters of a number of countries and are fished at successive stages in their life history by the different countries. Any solution will require regional cooperation.

II. Southern Areas

Total landings in countries bordering the Southwestern Indian Ocean, including Somalia and the Maldives but excluding landings by foreign fleets, have continued to increase from 131 000 t in 1981 to reach 311 000 t in 1992. The reported total actually represents a substantial under-estimate because much of the artisanal catch in the region is unrecorded. Due to this the true catches are probably in many cases closer to the potential yields than the landings data would indicate. Several resources in the Southwestern Indian Ocean appear to be fully exploited, as described in FAO Fisheries Technical Paper No. 335. Fisheries are a very important source of protein for human nutrition in many countries of the region. The strengthening of fishery data collection is a very important priority in order to provide an information base to support sustainable development and management that can yield secure sources of food and employment for the local populations.

Production by coastal fisheries in the Southwestern Indian Ocean is extremely low compared to other regions, being less than one-half of one percent of the world total. There may be several opportunities to increase this production. Greater utilization of by-catch from shrimp trawlers would be an important step. There may also be some limited scope for expansion of certain demersal fisheries off Mozambique, Madagascar and Tanzania, and for further development of artisanal fisheries off Madagascar and Somalia.

The greatest potential for increased fishery production in the Southwestern Indian Ocean region continues to lie in the development of small pelagic fisheries. Significant small pelagic resources are thought to exist off several countries, notably Seychelles, Somalia, Mozambique and Madagascar. The major issues regarding small pelagic fisheries seem to be in the economic sphere. The product has comparatively low value and expensive vessels and equipment are required to achieve the high catch rates required for profitability. The product would also face price competition from other regions where the stocks are larger and particularly efficient harvesting and processing facilities are in place. However, small pelagics are appreciated human food items in the region and in other parts of Africa, and might provide valuable sources of food, employment, and foreign exchange if the economic issues were solvable.

EASTERN INDIAN OCEAN (Area 57) (Table 13)

The reported landings for Area 57 in 1992 totalled 3.3 million t, a slight increase from the preceding year and a moderate increase (16.7%) from the 1990 figure. A 32% rise in invertebrate landings accounted for 27% of the total increase between 1990 and 1992, while reported landings of fish increased by about 14%. The 56% rise in penaeid shrimp landings (due to both a good fishing season for banana prawn and increased aquaculture production, primarily by India and Bangladesh) accounted for half of the total improvement in invertebrate landings.

I. Tuna Resources

Landings of tuna have slightly improved, the catch consisting of skipjack, yellowfin, albacore and other small tuna. The development of a longline fleet targeting tuna for Japanese sashimi markets, mentioned in FAO Fisheries Technical Paper No. 335, has proceeded, and the trend towards Indonesian ownership continued. A joint venture between Indonesian and Spanish boatyards has recently been established to build 26 such tuna boats. Tuna longlining by distant water fishing nations has continued to decline, with the remaining countries, Japan and the Republic of Korea, contributing only 0.7% and 0.2% of the total 1992 catch respectively.

Within the terms of an Australian-Indonesian memorandum of understanding Indonesian fishermen continued to operate in an offshore area adjacent to the Kimberly coast (the most eastern part of the Indian Ocean) targeting tuna. Some fishermen from Japan and New Zealand have been granted fishing rights in Australian waters through bilateral arrangements. As the stock of southern bluefin tuna is limited and heavily exploited, a regional initiative involving Japan, Australia and New Zealand in the joint management of this species has been established (see Table 21 and the Special Topics section on Tuna and tuna-like species for further information). With the termination of the Indo-Pacific Tuna Programme (IPTP), the cooperation in tuna fisheries between member countries will be accommodated within the framework of the India Ocean Tuna Commission (IOTC) which covers all States bordering the Indian Ocean, plus non-coastal States fishing in the Indian Ocean.

II. Northern Areas

In the Bay of Bengal, Myanmar proceeded with the development of its fishing grounds in Martaban Bay through joint ventures in fisheries and infrastructure with Singapore. The Mergui archipelago and the islands of Nicobar and Andaman are still a fish haven under the protection of Myanmar and India respectively. On the western side of the archipelago, however, over-exploitation of the coastal resources has led India to initiate joint venture fisheries in deeper waters.

Regional efforts to assist small-scale fisheries in the area have been carried out with the assistance of the Bay of Bengal Programme, which was funded by multi-donor agencies (see FAO Fisheries Technical Paper No. 335) and is now entering the final phase after more than ten years of implementation. The remaining project activities for the next five years will focus on strengthening the management of small-scale fisheries in selected sites of the participating countries (India, Indonesia, Bangladesh, Malaysia, Maldives, Sri Lanka and Thailand).

In general, the impact of environmental degradation on fisheries in the area is considered slight except in some specific coastal or harbour areas where poorly planned industrial development exists. In many developing countries the problem is very much related to increased population pressure and emerging industry in coastal areas. The absence of adequate waste treatment in many of these countries has been one of the major sources of environmental degradation. The poor condition of the Hugly Estuary of West Bengal (India) due to heavy pollution from untreated industrial discharge is worth mentioning, although the regular flushing by tidal waters evidently moves most waste offshore.

Particular concern is also evident regarding the destruction of marine habitats. Coral reefs and mangroves are degraded in all countries bordering the Bay of Bengal with pristine areas now being found only in small pockets along the west coast of Sumatra and along the northern Andaman Sea coast of Thailand. The wider impact of these disturbances on the balance between marine life and coastal habitats is generally unquantified at the current time.

Increased catches in the area are expected, and some may be derived from joint venture fishery arrangements in the development area between Thailand, Malaysia and Indonesia under the new Economic Triangle, or IMT-GT (Indonesian - Malaysian - Thailand Growth Triangle) Project, which covers the whole of the northern Malacca Strait.

III. Southern Areas

A twelve-fold increase in reported scallop landings by Australia between 1990 and 1992 contributed nearly 20% of the overall increase in invertebrate landings by all countries in Area 57.

The Australian catch from the southeastern part of the Eastern Indian Ocean is also characterized by the contribution of the rock lobster fishery in Western Australia. This is the highest value single-species fishery in Australia and has been subject to a management plan for a considerable time. Two species are targeted, Western Rock Lobster (*Panulirus cygnus*) and Southern Rock Lobster (*Jasus edwardsii*). The main fisheries management objective is to constrain fishing effort so that catches are maintained at a sustainable level, which is estimated to be between 8 000 - 12 000 t per year. The catch for the 1992/93 season peaked at a near record of 12 300 t; ex-vessel prices were around $Aust17.5/kg. The goodwill value (i.e. the value licence holders would sell licence rights for) of a lobster pot ranged from around $Aust: 7 500 to $9 500. This shows the benefits that can be created from successful limited entry management programmes. However, research shows that the rock lobster resource has been fished down to between 15 and 20% of the unfished biomass level, which is below the "internationally accepted" level of 25%. Log book data show that electronic fishing aides (e.g., Global Positioning Systems) have led to an increase in fishing power though catch-per-unit-effort has remained constant. An increased carapace size (115 mm) has been introduced, a ban on night fishing and a seasonal ban on catching females.

At the request of the Board of the Australian Fisheries Management Authority, explicit attention has been given to the problems of the southern shark fishery. The Southern Shark Fishery Management Advisory Committee formed a buy-out committee in 1993 to investigate issues related to such a programme.

NORTHWEST PACIFIC (Area 61) (Table 14)

After the peak total catches of over 26 million t observed in the late 1980s, total landings in Area 61 declined from 25.7 million t in 1990 to 24.2 million t in 1992. During that period, landings of Japanese sardine and Alaska pollack dropped by 2.24 million t and 678 000 t respectively. These declines were, to some extent, counterbalanced by increased landings of certain invertebrate species, principally Japanese flying squid, Japanese scallop, and Japanese clam. Landings of Japanese anchovy, largehead hairtail, chub mackerel, and Pacific cod also increased, though to a lesser extent.

In 1991, reported increases in marine landings (up some 150% from 1982) meant that China exceeded Japan in catch volume for the first time, and in 1992 the apparent gap continued to widen. The marine catch of Japan had been the highest worldwide throughout the 1980s, but has decreased since 1988. This reduction has been partly due to the reduced opportunities for distant water fishing but is principally due to the decline of sardine stocks within Japan's EEZ. The gross tonnage of the Japanese fishing fleet decreased by ~ 30% over the last ten years as distant water fishing operations declined.

The increases in landings for Japanese scallop, Japanese anchovy, largehead hairtail and chub mackerel for Area 61 were due to increased catch by China. The increase in total landings of Pacific cod was due to increased landings by the Russian Federation and Japan, while Japan and the Republic of Korea increased landings of Japanese flying squid.

The over-exploited state of the Alaskan pollack fishery, especially in the Okhotsk Sea and Nemuro Strait areas, has become more apparent, and the trend towards an increasing proportion of landings consisting of low value, undifferentiated fish has continued.

I. East China Sea

Both catches and fishing effort continue to rise in the East China Sea. The total power of Chinese fishing vessels operating in the area has increased by a factor of approximately 7.6 between the 1960s and early 1990s, while catches have increased by a factor of 2.6. Thus the catch-per-unit effort (CPUE) has also dropped (by a factor of 3). This has been accompanied by a dramatic shift in catches from large high-valued species to smaller, lower valued ones: from demersal species to pelagic species; from higher trophic level species to lower trophic level species. The quantity of mature fishes in the catches has dropped greatly, with the bulk of present catches consisting of immature fish. Total multi-national catch (including Rep. of Korea, Japan, etc.) is more than 3 million t. The need for a reduction in fishing effort is considered urgent.

II. Yellow Sea

In the Yellow Sea, fisheries resources are at a low level compared to three decades ago. As in the East China Sea, there is a trend toward catching small plankton-feeding pelagic fish which is ascribed to the removal of demersals and larger predatory pelagic fishes. For example, anchovy has increased dramatically since the early 1980s and is now the major component of fish biomass.

Environmental problems affecting fisheries include land reclamation, extensive mariculture, heavy metal pollution and oil spills. There appears to be an increasing frequency of red tides. Virus and bacterial epidemics are causing mortality in cultured penaeid shrimps.

III. Japan

As described above, total landings for pelagic species dropped sharply between 1990 and 1992 (down from 7.5 million t to 5.3 million t). This is clearly predominantly due to the declining landings of Japanese sardine, although the 670 000 t of chub mackerel landed in 1992 is well below the average 1.3 million t per year observed in the 1980s. Chub

mackerel is at a low population level, with only 1992 being a strong year-class in recent years. Only Japanese anchovy showed a clear upward trend in landings, although the absolute volumes landed have not been large relative to the sardine. Anchovy is fluctuating at relatively high (historical) levels in Japanese waters. Pacific saury population size also is fluctuating around relatively high levels, with strong fishing regulation keeping annual catch relatively stable. Jack mackerel is increasing and the population recovering to relatively high levels. Yellowtail has an increasing tendency in waters west of Japan. In the Sea of Japan, Japanese common squid (*Todarodes pacificus*) is maintaining relatively high population levels, while on the Pacific side of Japan the population is still low but showing an increasing tendency.

The declining catches and abundance of Japanese sardine are not necessarily due to fishing and have been linked to decadal-scale changes in the marine environment, as discussed in the Special Topics section on Environmental Issues in Marine Fisheries.

NORTHEAST PACIFIC (Area 67) (Table 15)

Total reported landings for Area 67 in 1992, at 3.15 million t, remain within a few percentage points of the average 3.24 million t reported in the late 1980s. Landings by the USA continue to dominate the statistics, constituting nearly 90% of the total landings by all countries for the area. The relatively low 1991 total of 2.97 million t, the lowest on record since 1985, was primarily due to reduced catches of North Pacific hake and Alaskan pollack, although lower than normal catches of flatfish due to early closures enforced by halibut by-catch restrictions (see FAO Fisheries Technical Paper No. 335) also contributed.

I. Salmon Resources

Landings from the major pacific salmon stocks increased between 1990 and 1991, as predicted (see FAO Fisheries Technical Paper No. 335), but total landings for 1992 returned to a level close to the average 387 000 t per year reported in the late 1980s. The largest increases in landings between 1990 and 1992 came from US landings of sockeye and chum salmon (up 12 953 t and 6 459 t respectively), while the largest declines were in US landings of pink salmon and Canadian landings of sockeye, pink and chinook salmon (down 31 153 t, 16 175 t, 11 255 t and 8 953 t respectively).

Overall, Gulf of Alaska - Bering Sea salmon stocks appear to be continuing in a high production "regime", although there have been recent declines of certain runs in certain local areas. All Pacific salmon species are considered to be fully utilized. Some runs are locally over-utilized. While large-scale driftnetting has been terminated, by-catch of salmon by the demersal trawl fisheries is considered a problem.

There is concern about degradation of spawning and rearing habitats due to logging, mining, and coastal development (logging has affected 100 000 acres of stream-side habitat and 3 000 miles of streams; from 1981 to 1988, development was allowed on about 41 000 acres of Alaskan wetlands (source: "Our Living Oceans", US Dept. of Commerce)).

On the US west coast, all five species of salmon are considered to be over-utilized. The Snake River stock of sockeye salmon has been listed as endangered under the US

Endangered Species Act. The spring/summer and autumn runs of Snake River chinook salmon and the winter run of Columbia River chinook salmon are listed as threatened. There is concern about the potential destruction of wild runs by hatchery production. In recent years, chinook and coho salmon runs off the US States of Washington and Oregon have declined so much that the fisheries are severely restricted. This is in spite of on-going releases of hatchery-reared smolts.

Off British Columbia, salmon catches are near historical high levels. However, in the south the chinook and coho stocks are beginning to show effects similar to Washington and Oregon.

II. Groundfish Resources

Some of the major groundfish stocks that grew rapidly during the high production "regime" of the mid-1970s to mid-1980s continue to slowly decline. This includes the very large Alaskan pollack stocks of the region. Exceptions may be the Pacific cod and arrowtooth flounder. Pacific cod makes up the second largest component of the catches after poll0ck and has had very good recent recruitment. Total landings of Pacific cod in 1992 remained at 260 000 t, the same as in 1990 and 1991. Until the late 1980s, landings of pacific cod varied between 39 000 and 150 000 t. Landings of arrowtooth flounder, at 27 000 t in 1992, first exceeded 10 000 t only in 1990. Most demersal stocks of the region are considered to be fully utilized.

One of the pollack stocks in the "Doughnut Hole" of the central Bering Sea was subject to multi-national over-exploitation and has declined to a very low population size. All the nations fishing the "Doughnut Hole" have agreed to suspend fishing in that area for 1993 and 1994.

Groundfish production in British Columbian waters remains high. Off the west coast of the USA, groundfish fisheries have increased in both size and value over the past decade. Most groundfish stocks are now considered to be near MSY levels.

In the US EEZ, fisheries are managed to protect the most vulnerable stock. For example, when halibut and cray by-catch limits are reached, the important groundfish fisheries are closed.

III. Small Pelagics

Herring is an extremely important fishery in the region (e.g., British Columbia's most valuable fishery). Except for local areas, British Columbia's herring stocks are at a high level of abundance. Throughout the sub-Arctic Pacific, various herring stocks show varying abundance levels, with no clear overall trend. Total landings for Pacific herring increased to 101 461 t in 1992 (up 24% between 1990 and 1992), the first time landings have exceeded 100 000 t since the 1970s. Atka mackerel landings increased 170% (to 60 228 t between 1990 and 1992.

Northern anchovy biomass off Southern California and Baja California has declined and the geographic range has shrunk. Current biomass is estimated to be less than 100 000 t and anchovy are not available off Baja California.

Sardine biomass has increased dramatically off Southern California and Baja California during the recent decade, with population growth rates estimated as high as 40% per year. Current biomass is of the order of 200 000 t and harvest levels have recently increased to about 60 000 t per year.

WESTERN CENTRAL PACIFIC (Area 71) (Table 16)

The Western Central Pacific is dominated by a large area of continental shelf, which to the west stretches from Vietnam and Thailand down to Malaysia and western Indonesia before ending at the Java Sea. To the east, the shelf reaches between eastern Indonesia, Papua New Guinea and Australia. The area is rich in demersal resources, including penaeid shrimp, and small pelagic resources. In the offshore areas, including those adjacent to oceanic islands of the Pacific, there are rich tuna resources.

Total fisheries landings in this area in 1992 was 7.7 million t, representing a slight increase (2.4%) on the 1990 figure and a decrease (1.8%) from the preceding year. The main landings are still contributed by Thailand, the Philippines and Indonesia with the bulk of the landings in Indonesia and the Philippines coming from the small-scale fisheries sector, whereas in Thailand the fisheries sector is on a larger, more commercial scale. Shrimp catches increased by 9.7% between 1990 and 1992 due to increases in coastal aquaculture production throughout Southeast Asia, and landings of banana prawn in the Australian northern prawn fishery.

I. Tuna Resources

Reductions in tuna landings have occurred partly due to the declining catch of distant water fishing nations: principally Japan, Republic of Korea, USA and Taiwan (Province of China). However, their skipjack catch in 1992 amounted to 454 000 t; more than twice the catch of the coastal states (211 000 t). Thailand, although not a tuna fishing country, has the main canning facilities in Southeast Asia, generating demand for tuna caught by neighbouring States as well as some distant water fishing nations. More than 29 million cartons of tuna were exported by Thailand in 1993, the highest of any country in the world.

Potential increase in catches may be obtained through further increased catches of tuna off Papua New Guinea. A recent study has indicated that the exploitation of skipjack and yellowfin overall in the Western Central Pacific has been considered low, and thus there is still room for further expansion.

II. Northern Areas

In FAO Fisheries Technical Paper No. 335 it was stated that up to 1990 the increases in total landings observed in the Area 71 were primarily attributed to the expansion of fishing onto new grounds, although increased investment also played a part. However, it was also noted that several coastal stocks were fully exploited, and that management actions had not been entirely successful in decreasing capacity. Over-exploitation of resources is continuing in various coastal waters off Thailand, the Philippines and Indonesia; an indication of the over-capacity of the fishing fleets in those areas. It appears that landings from new grounds are being cancelled out by declining catches in traditional fishing areas. Strengthening

management efforts seems to be a priority action needed in those areas to ensure sustained catch. Fishing access arrangements exist in many parts of the area, but primarily in Indonesia and Australia, either with neighbouring countries or distant-water fishing nations.

Environmental degradation has been noted in various parts of the Association of South-East Asian Nations (ASEAN) countries. Industrial development, population pressure, and the increase of coastal aquaculture have all played a major role. Frequent incidence of red tide and shellfish poisoning in some countries (Philippines, Thailand and Malaysia) have caused considerable economic loss to fisheries. Contingency planning to combat red tide has been developed in Brunei Darussalam and Malaysia.

III. Southern Areas

There have recently been signs that management actions in the Australian northern prawn fishery (now 25 years old) are having an effect. Production of tiger prawns in 1993 was only 2 500 t, the lowest since the fishery started, but the number of vessels was also significantly reduced in that year as a result of the compulsory reduction scheme. The catch-per-boat had risen by 20%. It is believed that the fishing power of vessels had increased by 40% since 1986, mainly from the use of (Global Positioning System (GPS) navigation aids - almost all boats now have such systems. Thus attempts at effort reduction through fleet-size reduction programmes were being balanced by increases in fishing power of boats. Total catch in the Gulf of Carpentaria tiger prawn fishery for 1993/1994 was 671 t less than the preceding year (3 181 t). This fishery is interesting in that catch predictions are based on rainfall.

Catches of banana prawns were better than average with the 1993 catch almost 1 000t higher than in 1992. Altogether 7 640 t of prawns (banana, tiger, endeavour and king) were caught (56.9%, 32.9%, 9.7% and 0.5% respectively). The 1993 season was the first since the implementation of the compulsory reduction phase of the fishery. Forty boats were removed, resulting in an 18% reduction in the nominal fishing effort. The average catch-per-boat increased substantially; 23 t per boat higher than in 1992. This is the third highest since the fishery began. This fishery extends from Collier Bay in Western Australia (actually in FAO Statistical Area 57) to Weipa in the East (Queensland).

EASTERN CENTRAL PACIFIC (Area 77) (Table 17)

As suspected, total catches in this area continued to decrease. This has mainly been due to the impact of a medium intensity "El Niño" that affected the area in 1991 and 1992. Total catches decreased from 1.7 million t per year in the late 1980s, to 1.5 million t in 1991 and 1.3 million t in 1992.

The most noticeable change has been in the landings of the North Pacific anchovy (*Engraulis mordax*) whose catches dropped sharply from 111 000 t in 1989 to only 6 000 t in 1990, 21 000 t in 1991, and 10 000 t in 1992. This is a sharp loss compared to catches well above 100 000 t per year obtained in the early 1970s and 1980s, and is due to a sharp decrease in stock size, which has mainly affected Mexican fish stocks and fisheries. Mexican catches of this species (mostly used for fish meal) dropped from 105 400 t in 1989 to only

3 400 t in 1992. In the USA, catches of Californian anchovy (mostly used for bait) have remained more or less stable at around 6 000-8 000 t per year.

Some decrease has also been noticed in the total catches of the Californian sardine (*Sardinops sagax caeruleus*), chub mackerel (*Scomber japonicus*), Central Pacific anchoveta (*Cetengraulis mysticetus*), Eastern Pacific bonito (*Sarda chiliensis*) and several species of large pelagic fish, including the yellowfin tuna (*Thunnus albacares*).

The drop in the total catches of Central Pacific anchoveta off Panama, from 121 000 t in 1989 to 70 000 t in 1992, has been only marginally compensated by an increase in thread herring (*Opisthonema libertatis*) landings from 10 000 t in 1989 to 33 000 t in 1992.

Catches of other species have remained more or less unchanged in recent years. Squids (mostly *Dosidiscus gigas*) seem to be abundant in the area, as well as in Area 87, but this species still remains underexploited.

SOUTHWEST PACIFIC (Area 81) (Table 18)

The reported landings for 1992 totalled 920 000 t; down only 7% on the 1991 figure, and virtually identical to the 1990 figure. Only landings of southern blue whiting showed a clear trend; increasing from 42 000 t to 133 000 t between 1990 and 1992. The Foveaux Strait oyster fishery (for *Ostrea spp.)*, once the largest dredge fishery for oysters in the world, continues to be in an extremely depressed state because of severe mortalities caused by disease. Vessels are permitted a catch of two sacks, where at one time catches of 115 000 sacks/vessel/season were permitted. Thus, in reality, the fishery has been closed.

New Zealand

Industry satisfaction with the ITQ management system of which New Zealand has been a pioneer, continues to consolidate though considerable (and unavoidable) uncertainty in many of the assessments performed for many of the stocks remains. About 160 stocks are now in the ITQ system and the plan is to expand this to include all significant stocks.

Hoki, or blue grenadier (*Macruronus noveazealandiae*), continues as the main species landed. Virtually entirely an export fishery, the fishery is now almost entirely prosecuted by either New Zealand vessels or vessels under charter to New Zealand companies. The fishery has experienced some strong year-classes in recent years and stocks are in good shape. At the request of the industry, quotas have been kept conservative. The emphasis of the fishery has shifted from the West Coast spawning grounds to the Cook Strait area. Unlike most species in New Zealand, hoki is still managed as a single stock.

Fishing practices in the hoki fishery have been changed to minimize mortality to fur seals, which appear to be making a comeback. Mortality of hooker sea lions in squid fisheries has also been reduced by changes in the fishery's fishing practices. Faring has been found to enhance the visibility of cables, and this has reduced mortality to seabirds, particularly albatrosses that were otherwise being trapped by sounder cables, etc.

Orange roughy (*Hoplostethus atlanticus*), as is now well accepted, is a long-lived species with a maximum age of more than 100 years. Differences remain between managers and industry as to the sustainability of current harvest levels, which have been the subject of a recent court challenge by conservation groups. It is anticipated that quotas will be reduced to increase the chances of a sustainable harvest of orange roughy. Collaborative exploratory fishing for new species continues to locate new, albeit smaller, stocks of orange roughy. Market acceptability for this species continues to remain strong. Western stocks of orange roughy that occurred beyond New Zealand's EEZ, in the region of the Lord Howe Rise, are severely depleted, and are unlikely to support commercial fishing within one to two generations. Similar fears exist for some of the eastern stocks.

Rock lobsters *(Jasus edwardsii*) stocks are generally agreed to be under pressure. Again, differences of opinion exist between the industry and managers as to what is the best level of fishing mortality, and thus at what level the quota should be set. Levels of recruitment appear related to the El Niño southern oscillation. On the marketing front, gains are being made in value-added activities through shipment of product live to Japan and the USA, among other important markets. Catch rates in the Chatham Islands remain substantially higher than those for the mainland fishery, though the bulk of the catch is still taken in southern waters.

Golden snapper (*Chrysophrys aurata*) stocks continue to be in reasonable shape with reasonably strong year-classes in recent years. It has been shown that year-class strength depends on water temperature at the time of spawning. Snapper, which is found in the northern part of New Zealand, forms an important recreational fishery which leads to frequent conflicts of interest with the commercial sector. Recreational fishermen would prefer to catch larger individuals. Many traditional inshore species are experiencing heavy fishing mortality though considerable uncertainty exists about the status of these stocks; in part, a consequence of the scarcity of research funds.

Landings of squid remain depressed mainly because of low prices. The southern blue whiting (*Micromesistius australis*) fishery, until recently exploited by Russian vessels, has been nationalized. This fishery, mainly found around the sub-Antarctic islands (Bounty and Campbell Islands and the Pukaki Rise), has expanded considerably over the last three years and catches are probably close to the MSY.

The trend towards value-added shore based processing continues, and the value of fish exports from New Zealand now exceeds receipts from wool exports. More than 80% of landings are exported. The Maori Fisheries Act has been an important landmark in recognizing aboriginal rights in the fisheries under Treaty of Waitangi obligations. Maoris, in a recent settlement, have become major shareholders in New Zealand's largest fishing company as part of the terms of settlement of treaty claims.

Australia

The fisheries of Australia fall within FAO Statistical Areas 57, 71 and 81. The fisheries in Area 81 include those of New South Wales and parts of the south east trawl fishery, the east coast tuna fishery, and the southern bluefin tuna fishery. Catches of east coast tuna increased by around 80% between 1990 and 1992, principally due to increased

catches of albacore and skipjack. No catches of southern bluefin tuna were reported in the east coast tuna fishery for 1992 or 1993.

For the southeast trawl fishery, the largest quotas set have been for blue grenadier (10 000 t) and orange roughy (8 000 t). Other important minor stocks are flathead (3 500 t), school whiting (2 000 t), spotted warehou (2 500 t) and jackass morwong (1 500 t). Recreational fishing remain very important in Australia, with annual catches amounting to about 14% of total landings: 18% of households have recreational fishers. They landed 31 000 t with an average annual catch of 27 kg.

Reported landings for the fisheries of New South Wales have remained relatively stable. As mentioned in the review of fisheries in FAO Statistical Area 57, and the special topic on Tuna and tuna-like species, southern bluefin tuna stocks are strictly managed under tripartite agreements among Australia, Japan and New Zealand.

SOUTHEAST PACIFIC (Area 87) (Table 19)

Total landings in this area seem to be levelling off at around 14 million t per year since 1990, after an increasing trend that started in 1983-84 and brought the total catches from around 10 million t per year to the current 14 million t per year. Current catch levels are now similar to the pre-1972 collapse of the anchoveta fisheries, but the species composition is quite different. Major changes seem to be occurring in this area, particularly with respect to the pelagic fish stocks such as anchoveta, sardine, mackerel and horse mackerel. The area was affected by a mild "El Niño" phenomenon in 1991 and 1992 that, to some extent has been responsible for a slight decrease in the total catches of some species.

The Peruvian anchoveta (*Engraulis ringens*) has replaced sardine (*Sardinops sagax*) as the main fish stock in the area. Catches of anchovy continue in an increasing trend, which seems to be associated with a recovery of this stock after the 1972 collapse and the low stock levels observed since then. Catches of Chilean horse mackerel (*Trachurus symmetricus murphy*) continued to increase, reaching almost 4 million t in 1991, to decrease to 3.4 million t in 1992. To some extent, the reduced landings in this species are due to the reduced catches of the long-range fleets (mostly from the Russian Federation) that were exploiting this stock in the high seas. Total catches of the sardine (*Sardinops sagax*) continued in their decreasing trend which started in 1985. From a maximum catch of 6.5 million t in 1985, total catches have dropped almost continuously to 3.1 million t in 1992. The decrease in the total landings of this species is related to a reduction in the stock-size and total area of distribution of the species.

Changes in the abundance and total landings of anchovy, sardine and other small pelagic fishes in the area seem to be associated with similar "regime changes" in other areas of the world. Inside the Gulf of California in the Eastern-Central Pacific, the stocks of California sardine (*Sardinops caeruleus*) are decreasing consistently, while the stocks of anchovies in the same area seem to be increasing, as is the case for the Japanese sardine (*Sardinops melanostictus*) in the Northwest Pacific.

Catches of hake in area 87 decreased slightly in the last couple of years. Another major change occurring in this area has been the increase in abundance of catches of the squid (*Dosidiscus gigas*). Catches of this species increased from around 10 000 t per year during the 1980s to more than 120 000 t per year in 1991-92. Catches of other species are relatively stable or showing light year-to-year fluctuations.

SOUTH PACIFIC ISLANDS (AREAS 71 AND 77)

Stretching across the eastern half of FAO Statistical Area 71 and the southern parts of FAO Statistical Area 77, there is a distinctive fisheries region encompassing Micronesia, Polynesia and Melanesia. The following review concentrates predominantly on this region, but certain parts may also be relevant to fisheries off adjacent Asian countries, northern and eastern Australia and Hawaii, USA.

The total area of land (0.5 million km^2) in the region is small compared with the entire area (approximately 30 million km^2). The EEZs cover 25.2 million km^2, from which 19.8 km^2 is accounted for by small island countries excluding Australia and New Zealand.

The small island countries support 5.25 million residents (67% in Papua New Guinea), who rely heavily on living marine resources as a source of food and foreign currencies from licence fees as well as exports. The average consumption of fish is about 50 kg per person per year, but reaches 250 kg in some atolls. This can be compared with 8 kg per person each year in a continental country such as Australia.

This special review of the resources of the area has been split into two sections: offshore resources, and reef resources. However, there is a degree of overlap between the areas for several stocks and fisheries of the species discussed.

Offshore Resources

Tuna (especially skipjack, yellowfin and, to a lesser extent, bigeye and albacore) are the primary living resources of the region. They have occupied the forefront of research and consideration in the last fifteen years. Tuna are especially abundant off Papua New Guinea, the Solomon Islands and Kiribati, but also around Vanuatu and Fiji. These stocks have been significantly exploited by foreign fleets which pay fees to gain access to the various island's EEZs. The access fees have been negotiated on behalf of the island countries by the South Pacific Forum Fisheries Agency (FFA), which is based in Honiara, Solomon Islands, and was established in the mid-1970s. These fees are an important source of revenue for the governments of the small island countries. In 1993, the revenue from these fees increased compared with the previous year.

Some countries have taken measures to prohibit fishing within their EEZs if vessels do not offload and/or process catches at their ports. Virtually no at-sea transshipment is now taking place in the region due to the severe penalties imposed by FFA member countries. The use of ports for transshipment is having a significant positive economic impact on those countries where transhipments are taking place.

FFA's main activities involve the legal and economic issues concerning the development and management of tuna fisheries. However, the member countries have recently requested increased effort to be extended towards activities supporting research, development, management and conservation issues in nearshore waters (see below).

The South Pacific Commission (SPC), based in Noumea, New Caledonia, concentrates on fisheries research and development related to both nearshore and offshore living marine resources, including tuna. FAO is closely collaborating with both FFA and SPC. Its project on "Cooperative Research on Interactions of Pacific Tuna Fisheries" has a significant involvement in the South Pacific.

Tuna resources in the South Pacific offer a significant potential for the further expansion of exploitation by both foreign and domestic vessels (see the Special Topic on "Tuna and tuna-like species" in this report, and FAO Fisheries Technical Paper No. 335). Domestic tuna fisheries have developed significantly in recent years. In the last five years, domestic longline fisheries for fresh, chilled yellowfin and bigeye tuna developed off American Samoa, Fiji, Palau, Federated States of Micronesia, Marshall Islands, Guam, French Polynesia, New Caledonia and Tonga. Artisanal tuna fisheries exist off Kiribati, Papua New Guinea and French Polynesia. Spanish mackerel is also caught in significant quantities by many commercial fisheries of South Pacific islands. A limiting factor in these developments is the poor access to the sashimi markets offered by existing airline connections.

Another new development is the use of Fish Aggregating Devices (FADs), or "payao", by Pacific island fishermen. Traditionally, FADs have been deployed considerable distances from shore where they were relatively inaccessible to the island fishermen.

The offshore tuna landings from the western and central Pacific amount to about 1 000 000 t per year with a nominal value of a billion dollars. Less than 3% of this is landed by vessels of small island countries, and the relative value of the catch is even lower. However, as is discussed below, the greatest impact at the community level is felt from fishery developments in the nearshore areas.

Reef Resources

The importance of the development of nearshore fisheries exploiting reef resources seems to be rarely given the attention it deserves by development planners, because relatively minor revenue accrues to governments from such developments.

Landings from the capture fisheries in the coastal waters of the islands are relatively modest (about 104 000 t per year worth an estimated US$243 700 000). The annual coastal production per capita is about 16 kg per year, or 27.4 kg per year if the large island population of Papua New Guinea is excluded. Of the inshore catch taken from reefs and estuaries, 80% is for subsistence purposes. If sold in domestic markets, the total subsistence catch would be worth around US$160 400 000. Most commercial catches of finfish are for domestic markets while most commercial catches of invertebrates are exported. The nearshore commercial capture fisheries generate an average annual income of US$83 300 000.

Most nearshore resources are dependent on reef community systems. The total area of reef in the South Pacific, including that off eastern Australia, is 77 000 km^2, or 13% of the world's reef systems in depths of less than 30 m. Unfortunately, the reefs are being damaged by human activities such as the removal of corals for building blocks or sale to tourists; certain fishing operations; the dredging of harbours, and the release of silt into the water, which blocks off sunlight and smothers coral reef polyps.

The reef-associated fisheries are extremely difficult to monitor due to the dispersed nature of fishing operations and landing sites, the use of a variety of fishing gears, the involvement of many species which can be difficult to distinguish, and problems with estimating the very substantial catches for home consumption (subsistence fishing). Additionally, only limited funds are available for research on these fisheries.

Most of the inshore resources of the South Pacific Islands are small and highly vulnerable. New commercial fishing, or a switch from subsistence to commercial fishing, will often result in over-exploitation. Communal groups such as villages traditionally had customary rights to fish in adjacent coastal waters. However, on many islands, the effectiveness of these schemes has declined as local populations increased, and traditional social patterns are replaced by money-based economies and commercial fishing. Management of coastal fisheries is an increasingly important priority, but, if success is to be achieved, mechanisms for the feedback of information on the status and trends in coastal fisheries must be improved on by fisheries managers and administrators.

Just under half of the nearshore commercial landings are made up of reef finfish, which constitute a similar proportion of subsistence landings. Most catches from nearshore reef fisheries are consumed at, or close to, landing sites, but as economies develop and urbanization proceeds, the dispersion of the consumption increases. Some of the coral reef fishes are also caught for export for the aquarium market (e.g., off the Cook Islands, Fiji, Palau and Tonga). Some other fish are caught for live food export.

Many of the coral fish species are territorial. Travallies, groupers and surgeonfish produce larvae which drift far out into the ocean before returning to coral reefs across the Pacific. The larvae of other fish, such as snappers and parrotfish, change to adult forms soon after hatching. Pelagic fish such as barracuda and Spanish mackerel are commonly found around inshore reefs preying on smaller fish. Small pelagic species that are utilized as bait for tuna fishing extend their distribution beyond reefs.

Examples of depleted fish resources include: reef and lagoon fish stocks off Palau and Kiribati; bone fish, milkfish and parrotfish off the Cook Islands; some large Serranids and Lutjanides off Fiji, and reef and small pelagic species off Western Samoa.

Other marine species have been subject to considerable fishing effort. These include: beche-de-mer (sea cucumbers); sea urchins; giant clams; pearl oysters; sea snails (green snails and trochus); cephalopods (octopus, squid, cuttlefish and nautilus) and spiny lobster. Some species of sea cucumbers caught off Papua New Guinea, Solomon Islands, New Caledonia, Vanuatu, Fiji, Kiribati and Tonga are boiled, smoked and dried for export to Southeast Asia. The reproductive organs of sea urchins are regarded as delicacies in many countries of the world. Trochus shells, originally found off Melanesia, Fiji, Wallis and the

Western Caroline Islands and transplanted to other islands, provide material for the manufacture of buttons (1 500 to 2 000 t per year). In Southeast Asia, the dried muscles of giant clams are regarded as a delicacy. The pearly inner layer of shells of some molluscs have been traditionally used to make ornaments and fishing lures. There is a long history of exploitation for many of these species. Shell fisheries have been supplying export markets for decades, while beche-de-mer has been targeted for centuries. Most of them are also used locally for food, including several crab species: coconut crabs spend the majority of their lives out of the water. Mangrove crabs are normally found in extensive estuary systems. The spanner or kona crab is found in deeper waters.

Further offshore there are valuable deep slope reef species including snappers and groupers as well as emperors and jacks. These species have not traditionally been subject to subsistence fishing and show a potential for tourist and export markets. They are a basis of fisheries off islands such as Tonga, Fiji, Vanuatu, Papua New Guinea and American Samoa. Many of these fisheries have contracted following initial expansion due to various reasons, including declines in catch rates and reduced effort, as fishermen attracted by better profits, turned to tuna fishing.

Shrimp resources are also confined to deeper waters on the reef slope. They are commercially caught by trawlers off Papua New Guinea. Shrimp aquaculture involving species such as the giant tiger prawn has been carried out on a small scale in several South Pacific Islands.

Sharks are of considerable importance to subsistence fishermen as a source of food and income from the sale of dried fins. The coastal and oceanic species of flyingfish offer a potential for the development of fisheries with some South Pacific Islands already having such fisheries. All species of marine turtles, including those occurring in the South Pacific, are listed in Appendix I of the Convention for International Trade in Endangered Species of Wild Fauna and Flora (CITES).

It is clear that considerable potential for fisheries development still exists in South Pacific Islands. However, the complex nature of many of the fisheries, and the vulnerable nature of both stocks and habitat, demands a careful approach by fisheries managers and administrators.

SOUTHERN OCEANS (Areas 48, 58 and 88) (Table 20)

An important development in the Southern Oceans has been the reduction in krill harvests. While immediately previously the catch has been about 300 000 t, in the 1992/93 season the catch fell to about 87 000 t because of a reduction in Russian and Ukrainian fishing effort for this species. Surveys indicated an abundance of 30.8 million t of krill in Area 48. A resource issue of particular concern was that "significant" numbers of juvenile icefish, *Champsocephalus gunnari*, and other species were being taken as by-catch in the krill fishery.

No catches of icefish were reported for 1992/3. The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), set low quotas for icefish following stock assessments, but the decline in catches has been predominantly due to a couple of large declines in biomass detected by UK trawl surveys. The cause(s) of these major declines is unknown but is believed to be related to the recent poor years for krill.

The only reported catches of finfish species in the CCMLAR Convention area during the 1992/3 season were of Patagonian toothfish, *Dissostichus eleginoides*, of which 5 771 t were taken in subareas 48.3 and 58.5.1 combined. Concern is arising within the Commission regarding the control of this straddling stock in areas that lie immediately outside the CCAMLR Convention area.

Other species also appear to occur in stocks whose distributions fall both inside and outside the convention area. These phenomena show that even in the Southern Oceans, problems of by-catch, are responsible fishing issue, and fisheries for stocks in several jurisdictions, are also a management concern.

The Commission had identified principles to be applied in situations of uncertainty, particularly those of increasingly poor data availability. Management measures should follow precautionary low catch levels as specified advice on TACs became less reliable, and further research should be undertaken to reduce uncertainty.

The CCAMLR is unusual among international marine resource commissions in that it has a statutory obligation to take into consideration ecosystem interactions in the management of marine resources. For example, ecological relationships must be maintained between harvested and dependent populations of Antarctic marine living resources, and depleted populations must be managed to restore them to a level at which the greatest net annual increment [in biomass] occurs. The risk of changes that are not potentially reversible over two or three decades must be minimized. As a consequence, an objective is to keep krill population levels at a higher level than if there were only single species considerations. The management focus should be on the lowest biomass that might occur over a future period, rather than on the mean biomass level.

Management approaches of particular interest are the use of precautionary catch limits, the requirement of advance notice and data needs prior to the development of a new fishery, with catch and effort regulations applied to exploratory fishing; prohibition of bottom trawling; and the integration of experimental and commercial activities. The extent to which similar management approaches are adopted by other fisheries regulatory bodies will be observed with considerable interest.

The other notable recent event for the Southern Oceans was the declaration of a whale sanctuary south of latitude 40°S by the International Whaling Commission (IWC). If effective, this should have the result of a gradual recovery of whale stocks in the area with unknown, but presumably major, impacts on predator-prey relations and levels of low-trophic-level prey organisms.

C. SPECIAL TOPICS

PRECAUTIONARY PRINCIPLES OF FISHERIES MANAGEMENT

The present status of many fishery resources around the world indicates that management practices need to be improved and particular attention is required for high seas fisheries. The uncertainty and related risk resulting from intrinsic inefficiencies in fisheries management, insufficient scientific information and natural variability (including climate change) is progressively being recognized and taken into account. An acceleration of the process of evolution of fisheries management, and a broadening of its scope are required to take fully into account both the explicit requirements of the 1982 UNCLOS and those of Agenda 21 of UNCED. A global trend is developing in favour of the concept of precaution, which should now also be considered for implementation in fisheries management.

The concept of precaution requires management authorities to take pre-exemptive action where there is a risk of severe and irreversible damage to human beings and, by extension to the resources and the environment, even in the absence of certainty about the impact or the causal relationships. When there is doubt about the effect of a technology or fishing practice on the marine environment and resources, preventive or remedial action would have to be taken, erring on the safe side, with due consideration to the social and economic consequences.

The need for precaution in management is reflected in two main concepts: the precautionary principle and the precautionary approach. The precautionary principle has suffered from a lack of definition and slack usage leading to extreme interpretations regardless of economic and social costs. It has therefore developed a strong negative overtone. The precautionary approach, which implicitly recognizes that there is a diversity of ecological as well as socio-economic situations requiring different strategies, has a more acceptable "image" and is more readily applicable to fisheries management systems.

Precautionary management measures have often been advocated in the past but they have rarely been implemented because of their potential short-term costs. On the one hand, they are needed to improve fisheries management and ensure more sustainable fisheries development, reducing risks for the resources and for fishing communities. For this purpose it is recommended to use more precautionary management reference points than in the past. On the other hand, overly stringent measures could lead to economic and social chaos in the fishing industry.

The requirement laid down in the Convention on the Law of the Sea for the "best scientific evidence available" remains the first condition for effective and equitable management, and the concept of precaution does not exempt fishing States and management authorities from their responsibilities to build up the necessary scientific information and cooperation. The best scientific evidence could be viewed as the statistically most sound evidence.

In a situation of high potential risk and lack or inadequacy of information, the concept of precaution requires that the onus of scientific proof (e.g., in the form of an environmental

impact assessment) be on those who intend to draw benefits from the resource and contend that there is no risk (i.e., reversal of the burden of proof).

The precautionary approach propounds caution in all aspects of fishery activities: in applied fishery research, in management, and in development. It can easily be translated into a "tool-box" of precautionary measures among which appropriate ones can be selected for different situations. It would be consistent with the internationally agreed principles of sustainable development and those of responsible fishing and would, *inter alia*:

- Promote the collection and use of the best scientific evidence;
- Adopt a broad range of reference points;
- Agree on a set of rules and guidelines;
- Adopt action-triggering thresholds;
- Agree on acceptable (tolerable) levels of impact and risk;
- Improve participation of non-fishery users;
- Improve decision-making procedures;
- Promote the use of more responsible technology;
- Introduce prior consent or prior consultation procedures;
- Strengthen monitoring, control and surveillance;
- Adopt experimental management and development strategies;
- Institutionalize transparency and accountability;
- Re-establish natural feedback controls.

GLOBAL RESOURCES OF TUNA AND TUNA-LIKE SPECIES (Table 21)

This topic was reviewed in detail in the previous Revision of this Circular and even more extensively in FAO Fisheries Technical Papers No. 335 and No. 337. Most of the general quantitative information published before is still valid. Updated information on catches, major fishing nations and the biological status of tuna and tuna-like species is presented in Table 21. Some qualitative and quantitative information specific to individual FAO Statistical Areas is given in sections of this Circular that correspond directly to these Areas. Relatively detailed information on tuna resources off South Pacific Islands is presented in another Special Topic section of this Circular on that region.

Due to significant interest and extensive discussions at various international and domestic forums, the following review concentrates on the two most expensive and over-exploited species of tunas. They are northern bluefin tuna in the Atlantic and the Mediterranean Sea and southern bluefin tuna, whose distribution extends to the Atlantic, Indian and Pacific Oceans. This information on bluefin includes details not presented in the previous FAO publications and it concentrates on recent developments.

Northern and southern bluefin tuna are temperate species. Their stocks are very vulnerable to over-exploitation. Their potential recovery is likely to be slow, regardless of the very high fecundity of the species. Giant females may carry over 60 million eggs.

The price for sashimi-quality bluefin tuna per kg can reach over US$ 200 paid at landing in Japan, and some caught fish can weigh over 500 kg (corresponding to a length

over 300 cm). Regardless of the fact that only very few fish reach such sizes and prices, it is still profitable to continue exploiting the species even when the abundance of fish is very low and consequently, the cost if fishing is very high. Also, because of the price of fish, restrictions in fishing are met with a lot of resistance.

The long lifespans of both northern and southern bluefin tuna allow a very substantial portion of each cohort to be eventually caught even with a relatively low rate of exploitation per year. Because the fish have to live for several years before reaching the age of first maturity, the time needed for a potential recovery of depleted stocks would be very long even with no catches.

I. Atlantic northern bluefin tuna

In the Atlantic and the Mediterranean Sea, fisheries directed at northern bluefin tuna are managed within the institutional framework of ICCAT, which is based in Madrid, Spain. ICCAT also provides an institutional framework for data collation and analysis, other research and the provision of fisheries management advice. ICCAT has the capacity to collect and process fishery data, to facilitate meetings and exchanges of information in general, but it does not have a research capacity by itself, relying on individual country members for this task.

For the Mediterranean Sea, ICCAT collaborates with GFCM, an FAO fisheries body, which relies even more heavily on the technical capacity of its member countries. Many of GFCM's countries fishing bluefin in the Mediterranean Sea are not members of ICCAT, making this collaboration very beneficial in obtaining better data and information on bluefin fisheries.

In 1991, Sweden nominated Atlantic northern bluefin tuna to be included in the lists of species considered to be endangered under the Convention on the International Trade in Endangered Species of Wild Flora and Fauna (CITES). However, in 1992, this proposal was withdrawn with the proviso that ICCAT and the countries involved will continue their initiatives to rebuild the bluefin stocks, keeping CITES informed about the progress being achieved.

In the assessment of Atlantic northern bluefin tuna two stocks are assumed to exist, with two spawning areas in the Gulf of Mexico and the Mediterranean Sea, and a limited degree of interchange between them. The assessment of each stock is carried out every second year. The last assessment of the western stock was done in 1993. The new assessment for the eastern stock has not been completed in time to be reviewed in this Revision of the Circular. Therefore, the Revision refers to the 1992 assessment for the eastern stock.

I.1 West Atlantic

The maximum annual catch of northern bluefin tuna in the west Atlantic was 18 679 t taken in 1964. With the exception of 1963 to 1966, the annual catches were below 7 000 t until 1982. From 1982 the annual catches were below 3 011 t, with the 1993 catch being 2 538 t. The last catch was taken mostly by the USA, Japan, Canada and Colombia (1 268,

581,459 and 228 t, respectively) principally by longlining, rod-and-line and purse-seining methods.

In 1993 the recent exploitable biomass of this stock was estimated on the basis of an analysis called Virtual Population Analysis (VPA), to be between 8 to 26% of its level in 1975. However, before 1975, much larger catches were taken (see above) and the stock might have been significantly reduced already in 1975. Using another analysis called production modelling, the same biomass was estimated to be 6 to 12% of that which could produce the MSY. The latter biomass may be half of the pre-exploitation level. In summary, the present level of biomass is evidently very low in comparison with pre-exploitation, regardless of any uncertainties in the data and other input information on the various assumptions and methods used. Moreover, simulations indicate that the 1992 catch of 2 188 t would be likely to result in a continued decline in the parental biomass of the stock.

Recently, the National Research Council of the US National Academy of Sciences and Engineering has critically reviewed the scientific basis for the management of the stock (the conclusions and recommendations are summarized in the Report of the National Research Council review of Atlantic Bluefin Tuna).

In 1993, ICCAT recommended that the combined quota for 1994 and 1995 be limited to 3 195 t, with 1 995 t in 1994 and 1 200 in 1995. These quotas are divided among Canada, Japan and the United States. By 1995, the countries are supposed to have developed a programme to increase the parental biomass of the stock by 50% by the year 2008.

I.2 East Atlantic and Mediterranean Seas

In the east Atlantic (excluding the Mediterranean Sea), the annual catch has been fluctuating between 3 331 and 10 834 t from 1963 to 1993 with the 1961 and 1962 catches being between 23 230 and 20 750 t. The 1993 catch of 9 563 t was taken by Spain, Japan, France, Libya, Morocco and Ireland (5 078 t, 2 484 t, 1 099 t, 312 t, 254 t and 190 t, respectively) using principally longliners, bait boats and traps.

The annual catch in the Mediterranean shows an increasing trend between 1961 to 1993. In the early 1960s, it was below 6 460 t per year, then below 10 515 t until 1981 (with the exception of 1974 to 1977), while in the early 1990s it was between 16 156 and 18 988 t. The 1993 catch was 18 397 t, taken by France (4 760 t), Italy (4 089 t), Spain (2 014 t), Panama (1 121 t), Tunisia (1 107 t), Libya (1 106 t), Algeria (800 t), Japan (793 t), Republic of Korea (573 t), Turkey (361 t), Greece (329 t), Taiwan, Province of China, (328 t) and Honduras (287 t), mostly by purse-seiners, longliners and traps. Some other countries also made small catches.

The collaboration of GFCM and ICCAT has led to significant improvements in the data available for the stock. However, the problem of inadequate data is still of major concern, especially for small fish. A low coverage of catches for length sampling (about 50%) with many samples much too small causes uncertainty in the stock assessment. The catches of fish less than one year of age are significantly under-estimated: another cause of major uncertainty. The level of catches is also uncertain to some degree.

About 90% of the catch in number comes from fish of 0 to 4 years old, regardless of the existence of a minimum size limit of 6.4 kg, which is clearly not complied with. Between about 20% and 60 % of the fish in catches taken between 1981 and 1993 were under-sized. The 1974 recommendation to limit fishing mortality to the level at about that time has not been complied with either. This limit is interpreted as referring to catches. The total catch was about 19 000 t in 1974 and less in the earlier years of the 1970s.

The 1992 stock assessment suggested that there is no evident trend in either recruitment to the fishery or the abundance of fish less than ten years old. However, the older fish have shown a considerable downward trend in abundance since 1970. During 1990 to 1992, the abundance of fish older than age ten was about one third of the levels observed in 1970 to 1972. However, as noted above, the stock was already intensively exploited by the early 1970s. The rate of fishing mortality has been increasing for most age classes.

In 1992, it was evident to ICCAT's scientists that higher long-term yields could be realized if fishing mortality rates were reduced, especially on young fish. Such a recommendation, as well as that to prohibit catches of fish smaller than 1.8 kg (one year old), were endorsed by the Commission. The Commission also made an effort to encourage adherence to the minimum size limit of 6.4 kg, which legally allows 15% of the catch to be under-sized. In addition, recognizing the need to reduce the intensity of exploitation, and to secure data and other information on bluefin fishing, the Commission recommended the prohibition of longlining in the Mediterranean Sea from vessels longer than 24 m between 1 June and 31 July, during which period many longliners using flags of convenience were seen to be operational in that Sea.

II. Southern bluefin tuna (SBT)

Southern bluefin tuna (usually referred as SBT), constitute a stock fished in the Indian Ocean, the South Atlantic and the South Pacific. The species spawns south of Java, Indonesia, from where juveniles migrate through the southern part of the Australian Fishing Zone towards New Zealand. Some other juveniles from the same spawning ground migrate west through the Indian Ocean towards South Africa.

Traditionally, SBT have been fished mainly by Australia and Japan (see Table 21). More recently, Indonesia, New Zealand, Republic of Korea, South Africa and Taiwan (Province of China) have also been exploiting SBT.

At present, SBT are fished mainly for the Japanese sashimi market. Some fish are kept in enclosures off Port Lincoln in South Australia to improve their condition before their export to Japan. The main fishing method used is longlining, with some catches taken by poling and purse-seining.

II.1 Scientific concern

In the first part of 1980s, it became apparent that the stock of SBT was depleted, leading to a need for a mechanism to limit catches and to rebuild the stock. Since 1982, annual meetings of fisheries scientists and managers from Australia, Japan and New Zealand

have been held and, since the mid-1980s, the three countries have established annual national quotas.

Since 1990, the quotas have limited the total annual catch of the three countries to 11 750 t with the allocation of 5 265, 6 065 and 420 t for Australia, Japan and New Zealand, respectively. The maximum annual catch of these three countries was 81 605 t in 1961.

II.2 Convention for the Conservation of Southern Bluefin Tuna

In 1993, the arrangement for management of SBT was formalized by Australia, Japan and New Zealand by agreeing to the text of the Convention for the Conservation of Southern Bluefin Tuna. The overall objective for the management of SBT fisheries is specified in the Convention as the "conservation and optimum utilization" of the SBT stock.

The First Meeting of the Commission for the Conservation of Southern Bluefin Tuna was held in Wellington, New Zealand in May 1994. This Meeting was preceded by the Thirteenth Meeting of Australian, Japanese and New Zealand Scientists on Southern Bluefin Tuna, also held in Wellington in April 1994.

II.3 First Meeting of the Commission for the Conservation of Southern Bluefin Tuna

According to scientists from Australia, Japan and New Zealand, as well as some external scientists, the stock of SBT remains severely depleted, with the parental stock at its lowest level ever. However, there are indications that the major catch cutbacks in 1988 and 1989 should now, or next year, begin to benefit the parent stock and reverse the decline. Also, improvements in recruitment in 1986 to 1989 above the very low 1985 level were demonstrated. If the recruitment and current fishing mortality are maintained during the 1990s, the stock recovery seems to be assured. This hypothesis relies heavily on the evidence from the observed improvements in the catch rate in 1993, which was not available to scientists during their previous meeting.

The meeting of the Commission discussed an Australian proposal for a mid-term management strategy for rebuilding the southern bluefin tuna stock. Its objective is the restoration of the stock to the 1980 level by 2020. Further work on the proposal will be done by the Commission out of session.

In the meantime, the Commission agreed to maintain the limit on global quota levels for 1994/95 at 11 750 t, with the national allocations remaining at 5 265 t for Australia, 6 065 t for Japan, and 420 t for New Zealand.

The Commission intends to hold a series of scientific meetings to develop better methods of data collection and to address various sources of uncertainty in the stock assessment. The urgent problem of the incidental take of seabirds by the SBT longline fishery will also be addressed.

Both Japan and New Zealand indicated that they would be pleased to accept Australia's offer to host the Secretariat for the Commission in Canberra at such a time when it is decided to establish a headquarters for the Commission.

Noting the participation of observers from Indonesia and the Republic of Korea in its First Meeting, the Commission emphasized the need for all countries involved in the exploitation of SBT to accede to the Convention or otherwise to participate in the conservation and management process.

MARINE MAMMALS

I. Seals

The populations of seals in some important fishing areas such as Scotia Shelf and northern Europe continue to increase. This, in turn, has added to the concern of fishermen that the increased numbers of seals are consuming significant quantities of fish, which, they believe, reduces their catches and contributes excessively to total fish mortality. For example, the grey seal (*Halichoerus grypus*) population on Sable Island has been increasing exponentially at about 12% per year. The Canadian seal population has increased from about 25 000 animals in 1977 to 80 000-110 000 animals in 1987. In British waters the seal population is reported to have increased at an annual rate of about 7.3% during the years 1989 and 1990. In Icelandic waters there is reported to have been a decline after 1990, while the decline in seal numbers has been greater in the Baltic.

In Namibia, oceanographic conditions resulted in an offshore displacement of the fish usually consumed by seals, causing significant pup mortality. In spite of this, harvesting of adults is intended.

II. Whales

The important decision in terms of whale stocks was the continuation of the moratorium on commercial whaling by IWC, though other subsistence and commercial whale fisheries continue to operate on some whale stocks that either fall outside IWC competence or occur in countries that are not members of the Commission. Permits for the capture of minke whales (*Balaenoptera acutorostrata*) for scientific purposes were issued for 300 minke whales in the Antarctic, 100 in the western North Pacific by Japan and 127 in the northeastern Atlantic by Norway. Recent genetic analysis has contributed to understanding the stock structure of this species in the North Atlantic and it seems that three stocks may exist. It seems clear that the North Atlantic stocks could sustain significant catches. However, the calculations of the actual catch limits will depend on the management objectives and the assumptions used in the management models.

The annual meeting of the IWC accepted and endorsed the Revised Management Procedure (RMP) for commercial whaling and various associated guidelines. However, until a whaling inspection and observer scheme can be agreed upon, a moratorium on harvesting will continue. It was observed that the species most vulnerable to the negative effects of any environmental changes are those that would have zero quotas under the RMP. A major innovation that was accepted was the creation of a Southern Ocean Whale Sanctuary (in those waters south of Latitude 40°S, except in the Eastern Pacific where it dips to 60°S and is continuous with the Indian Ocean whale sanctuary established in 1979, i.e., primarily where

Antarctic whaling would occur. This area is used by seven species of great whales including the highly endangered blue, right and humpback whales.

A number of smaller cetaceans are of particular concern. The term "small cetacean" is usually taken to apply to animals less than 10 m length though many such animals are whales. Belugas, or white whales (*Delphinapterus leucas)*, which are found in Arctic and northern boreal waters of the North Atlantic, are in possible conflict with shrimp fisheries in the Davis Strait - Baffin Bay, and with fisheries for capelin and cod in the Barents Sea. In the Gulf of Saint Lawrence and St. Lawrence River, there is conflict with industrial development, especially from contaminants such as organochlorines. While 20 000 to 30 000 animals are estimated to occur in Canadian waters, there is evidence of a decline in numbers. The East Greenland - Svalbard population is unlikely to exceed 10 000 animals and that for the Barents Sea-White Sea is probably less than 30 000 animals.

III. Dolphins and porpoises

Another small cetacean for which there is possible concern is the Harbour porpoise (*Phocoena phocoena*). This species is limited to temperate and sub-Arctic waters of the Northern Hemisphere. It is primarily a coastal species found in bays, rivers and estuaries. While this species has been harvested more widely in the past, harvests are only reported by Greenland and, on a small-scale, the Faroe Islands. This species is caught incidentally in gillnets and by demersal fisheries. Although the number caught is poorly documented, it could be substantial. Long-term data series show a significant decline in numbers in British and Irish waters since the 1960s and also, possibly, in the Baltic and North Seas. In the Western Atlantic, changes in summer abundance in the Bay of Fundy and Gulf of Maine are consistent with declines in numbers, though there have been confounding changes in prey abundance.

One of the most seriously endangered groups of small cetaceans are the river dolphins. These animals, which occur only in South America and Asia, are particularly susceptible to the effects of dam construction (through isolation into sub-populations), fishing and pollution. For example, it is estimated that the entire population of Yangtze river dolphins (*Lipotes vexillifer*) may be less than 200 animals. In the reaches of the Indus system it is estimated that there may be fewer than 700 dolphins of the *Platanista minor* species.

ENVIRONMENTAL ISSUES IN MARINE FISHERIES

Within the past year or two, it is becoming recognized that the most dramatic marine fish population fluctuations tend to appear as decadal-scale "regime" changes. For example, a pattern of population increases from the mid-1970s to the mid-1980s, followed by population declines after the mid-1980s, seems to have been remarkably widespread and consistent in a large number of marine ecosystems distributed over the world's oceans. During that decadal period, the ocean-atmosphere system of the Pacific Ocean basin seems to have been in an enhanced "El Niño"-type state, characterized by a relaxed dynamic situation in the equatorial Pacific (diminished trade wind circulation, etc.). This relaxed state in the tropical Pacific appears to have been countered by intensified situations in many other

regions of the world. It is possible that intensified ecological situations may promote population growth of some types of fishery resources.

For example, the mid-1970s to mid-1980s was a period of phenomenal productivity and growth of the major groundfish populations of the sub-Arctic North Pacific which sustained the massive expansions of the fisheries of that region through the period. Conversely, since the mid-1980s these populations are in incessant decline, in spite of continuing elaborate stock assessment activities and state-of-the-art fishery management efforts. The last period appears also to have been particularly productive in the tropical central North Pacific. Total chlorophyll in the water column appears to have increased north of Hawaii. Lobsters, sea birds, seals, and coral reef fishes in the northwestern Hawaiian Islands all seem to have experienced increased production; conversely, since the period ended in the mid-1980s, lobster landings from this area have dropped by two thirds and other biological populations are in a downward trend.

In addition, the very large populations of anchovies and sardines that dominate the fish biomass in the major eastern ocean upwelling regions of the world, as well as the northwestern Pacific off Japan, seem to have been rising and falling in phase. Both the Californian and Japanese fisheries grew during the 1920s and early 1930s to peak in the mid to late 1930s. (There were no corresponding landings off western South America because no significant fishing occurred.) Both populations remained extremely depressed for some three decades. The sardine fisheries in both regions then commenced sudden rapid growth near the mid-1970s, the same period in which enormous numbers of sardines appeared off South America initiating a massive fishery in that region. In the period since the Japanese scientist Kawasaki originally called attention to the synchronous pattern, an additional simultaneous reversal in trend has occurred. Toward the latter part of the 1980s, sardine landings in all three systems have begun to rapidly fall.

Since the advent of substantial fisheries, anchovy populations have been generally out of phase with the sardine populations in the three regions. Off California, after a time lag of about a decade following the sardine collapse, the anchovy population increased with over 340 000 t being taken in 1981. Off Japan, the anchovy catches grew during low sardine abundance after the initial collapse, attaining maximum levels of nearly half a million t during the late 1950s and the 1960s. The anchovy catches then gradually declined as the sardine population proceeded in its rebuilding phase. Recently, as the Japanese sardine population is declining, extremely large shoals of anchovy are reported.

In the Peru-Humboldt Current system off western South America, the fishery for anchovy (anchoveta) peaked in 1970 at more than 13 million t, constituting by far the largest single fishery that has ever existed on earth. It then collapsed to less than 1 million t after the 1972 El Niño, rebounded briefly to about 2 million t for several years, and then fell back following the 1976 El Niño to below 1 million t and remained at this relatively low level to the mid-1980s. The sardine catches were low while the anchovy was abundant, but the sardine population grew during the period of anchovy collapse to the point where nearly 6 million t were taken in 1985, the highest yield of any sardine fishery to date.

The fluctuations in the sardine fishery in the Benguela system off southwestern Africa tend to be opposite in phase to those of the three Pacific regions. Here, extensive sardine

fisheries began after world war II, peaked in 1968 at about 1.5 million t, and then collapsed. Anchovy catches grew as the sardine catches decreased, reaching about 600 000 t by 1974 and peaking at nearly 1 million t in 1987. Recently a precipitous decline has occurred. Indications from seabird diets, etc., as well as fishery landings, indicate that sardine is now again replacing anchovy as the dominant low-trophic-level fish population of the Benguela ecosystem.

Previously, there had been reluctance to denote these alternations as being actual replacements of one population by the other. The question of the time lags was worrisome; sometimes the "replacement" did not begin to occur for a decade or more (i.e., at least several generation cycles) after the other population had collapsed to low levels. Moreover, in an analysis of annually-varved anaerobic sediments in the Southern California Bight, the numbers of deposited scales of sardines in samples appeared to vary in phase with those of anchovies more often than they were opposite in phase. However, as more experience of regional-scale population variations has accumulated, with anchovies and sardines seldom being at high abundance levels at the same time, the evidence for at least some degree of actual replacement has become increasingly convincing. The conclusion has been drawn that regional "regime changes" in relative abundance of sardines and anchovies were initiated in all four regions (California Current, Peru-Chile, Northwest Pacific, and Benguela Current) in the second half of the 1990s.

Many other examples can be found of major marine population effects occurring during this same period of the mid-1970s to mid-1980s. For example, this was a period of increasing survival of Greenland halibut, a period of dramatic growth in the lobster landings in eastern Canada, a period of large increase in Newfoundland spawning northern cod stock, etc. On the other hand, North Pacific Albacore tuna appear to have suffered a steep population decline during the period.

IDENTIFICATION OF FISH SPECIES

The progress to date of the FAO Fisheries Department's Species Identification and Data Programme has been significant in providing identification and basic biological information for marine resource species, as an aid to improving the gathering of statistics and for general fisheries management. Africa, which was an area of high priority has been fairly well covered, to date. Another area of priority, Central and northern South America will soon be fairly well covered with the completion in 1994 of a major guide to the eastern central Pacific. Attention is shifting to southeast Asia and the island States of the Pacific with an on-going project to complete a guide for the western central Pacific. Long range plans include finding support for a series of national field guides for Central America, southeast Asia, and the Pacific Island countries, and for better coverage of fishing areas 87 and 41 of South America. Also to date, 16 species catalogues for major resource groups have been covered on a global basis, including an identification guide to marine mammals. Progress is on-going to cover an additional 24 major resource groups on a global basis.

Species Identification Guides and National/Regional Field Guides per Fishing Area

Fishing Area	Publications	Lang.	Year	Status
Northwest Atlantic (Area 21)	Covered mostly by US & Canadian Publications	En, Fr	-	-
West Central Atlantic (Area 31)	FAO Species Identification Guide	En	1978[oop]	Mod.Rev
	- FAO Field Guide N. Coast S. America	Sp	1992	OK
	- FAO Field Guide N. Coast S. America	En	1993	OK
Southwest Atlantic (Area 41)	FAO INFOPESCA marketing cat., Part I	Sp	1979	Bad.Rev.
Northeast Atlantic (Area 27)	Unesco publication	En, Fr	1984	OK
Med. & Black Sea (Area 37)	FAO Species Identification Guide	Fr	1987	OK
South Central Atlantic (Area 34 & northern half of 47)	FAO Species Identification Guide	En, Fr	1981	Sl. Rev.
	- FAO Field Guide Morocco	Fr	1984[oop]	Mod.Rev.
	- FAO Field Guide Senegal and The Gambia	Fr	1988	OK
	- FAO Field Guide Gulf of Guinea	En	1990	OK
	- FAO Field Guide Gulf of Guinea	Fr	1992	OK
	- FAO Field Guide Angola	Port	1986	OK
	- FAO Field Guide Namibia	En	1994	OK
Southeast Atlantic (S. Area 47)	Covered mostly by South African Pubs.	En	-	-
West. Indian Ocean (Area 51)	FAO Species Identification Guide	En	1984[oop]	Sl.Rev.
	- FAO Field Guide Gulf	En, Ar	1978	Rev. 1995
	- FAO Field Guide Tanzania	En	1985[oop]	Sl.Rev.
	- FAO Field Guide Madagascar	Fr	1984	Sl.Rev.
	- FAO Field Guide Mozambique	Port	1990	OK
	- FAO Field Guide Pakistan	En	1985	Sl.Rev.
	- FAO Field Guide Sri Lanka	En	1984	OK
	- FAO Field Guide Somalia	En	1995	Prep.
Eastern Indian Ocean (Area 57)	FAO Species Identification Guide	En	1974[oop]	Bad.Rev.
Northwest Pacific (Area 61)	Covered mostly by Japanese, Russian, and Taiwanese publications	Various	-	-
West Central Pacific (Area 71 plus South Pacific Comm. area)	FAO Species Identification Guide	En	1996	Prep.
Southwest Pacific (Area 81)	Covered mostly by New Zealand and Australian publications	En	-	-

Northeast Pacific (Area 67 plus northern part of Area 77)	Covered mostly by US and Canadian publications	En	-	-
East. Central Pacific (SE Area 77 plus north Area 87)	FAO Species Identification Guide	Sp	1994	Prep.
Southeast Pacific (Area 87)	FAO INFOPESCA marketing cat., Part II	Sp	1982	Bad.Rev.
Arctic Ocean (Area 18)	Covered mostly by US and Russian publications	En, Rus	-	-
Antarctic (Areas 48, 58, 88)	FAO Species Identification Guide	En	1986	OK
	FAO Species Identification Guide	Fr	1987	OK
	FAO Species Identification Guide	Sp	1988	OK

OOP = out of print
OK = no revision needed at this time
Sl.Rev = in need of slight revisions
Mod.Rev = in moderate need of revision
Bad.Rev = badly in need of revision
Rev. = revision planned and expected year of publication
Prep. = In preparation
Ar = Arabic
En = English
Fr = French
Port. = Portuguese
Rus = Russian
Sp = Spanish

D. MARINE RESOURCE TABLES

Tables 5-21.

NOTES FOR ALL TABLES

Source of information for all tables: 1970-1992 Yearbook of Fisheries (catches and landings), FAO, Rome

Additional sources of information by individual area:

Eastern Central Atlantic (Area 34)

1970-1992: CECAF Statistical Bulletins
1970: Provisional FISHDAB (Fishery Data Base, Rome)

Mediterranean and Black Sea (Area 37)

1970-1992: GFCM Statistical Bulletins

Southeast Atlantic (Area 47)

1975-1992: ICSEAF Bulletins
1989: Questionnaires supplied by member countries

Main fishing countries: The main fishing countries are listed in ranking order by catch size

Country descriptions: The former USSR is listed as USSR in the tables since the reorganization of the States had not occurred by 1990

Catches and landings: All catches and landings are expressed in tons are rounded to the nearest hundred tons

State of exploitation: The state of exploitation is for the latest information available and noted by the following abbreviations

?	=	Unknown/uncertain	U	=	Underexploited
M	=	Moderately exploited	F	=	Fully/heavily exploited
O	=	Overexploited	D	=	Depleted (i.e., catches remain at a low level, irrespective of effort levels)
R	=	Recovering (e.g. sharks were previously depleted for a period of years)			

NOTE TO READERS: If you have information that you believe will contribute to improving the accuracy of future revisions of this document, you are kindly requested to entitle it "C884 Revision" and send it to Chief, Marine Resources Service, FAO, Viale delle Terme di Caracalla, 00100 Rome.

Table 5
Northwest Atlantic (Area 21)

Stock a/	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Atlantic cod	Canada,USA,Spain,St.Pier Miqu, Portugal,Greenland	972	538	654	636	669	601	626	639	552	423	246	F-O
Red hake	USA, Portugal	45	15	3	2	2	3	2	2	2	3	3	D
Haddock	Canada, USA	35	42	67	41	55	35	35	30	26	25	25	D
Saithe (Pollock)	Canada, USA	34	43	54	68	78	75	61	58	51	52	44	F
Silver hake	Russian Fed., USA, Cuba	270	136	71	95	103	78	91	106	91	77	45	U
Roundnose grenadier	Spain, Portugal.	42	24	5	6	8	8	6	5	4	4	7	M
Atlantic redfish	Canada, Korea Rep. Russian Fed.	267	166	123	163	169	208	148	164	180	172	156	F-O
Flatfishes	Canada, USA, Spain	284	238	213	199	220	222	183	163	167	181	134	F-D
Other groundfish	USA,Canada,Portugal,Greenland	137	118	94	104	113	122	96	90	119	179	141	
Capelin	Canada	130	217	42	86	84	66	110	118	184	51	31	R
Atlantic herring	Canada, USA	612	320	199	258	223	287	284	275	314	277	270	R
Atlantic menhaden	USA	273	267	313	297	222	297	327	326	395	346	313	F
Atlantic mackerel	Canada, USA, Russian Fed.	355	133	29	69	64	74	79	74	66	62	38	U
Other fish	USA, Canada, Japan	140	91	59	65	57	80	54	62	58	69	10	
Total fishes		3596	2348	1926	2089	2067	2156	2102	2112	2209	1921	1553	

Table 5 (continued)

Stock a/	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Crabs	USA, Canada	46	50	95	89	94	80	87	86	90	103	83	F
American lobster	Canada, USA	30	33	43	60	59	60	63	67	74	76	66	F
Northern prawn	Greenland, Canada	12	42	47	76	68	76	87	91	94	101	107	F
Other shrimp	Canada	13	8	11	18	15	18	19	20	24	25	23	F
Total crustaceans		101	133	196	243	236	234	256	264	282	305	279	
Amer. cupped oyster	USA, Canada	173	146	118	51	72	59	38	34	28	22	30	
Cupped oysters nei	USA	0	0	0	0	0	0	1	1	11	20	19	
Scallops	USA, Canada	73	182	152	165	129	190	191	206	219	211	197	F
Clams (quahogs, soft shell)	USA, Canada	231	232	325	409	418	395	382	414	420	402	432	F
Squids	USA	45	118	58	26	23	24	22	37	39	36	41	
Other molluscs	USA, Canada	5	8	15	32	31	28	42	34	27	25	32	
Total molluscs	USA	527	686	669	683	673	696	676	726	744	716	751	
Others		1	1	1	2	1	1	3	4	7	10	13	
Total area		4225	3168	2792	3017	2977	3087	3037	3106	3242	2952	2596	

a/ Part of stock occupies Western Central Atlantic (Area 31).

Management measures. All important stocks in Canadian, NAFO (Northern Atlantic Fisheries Organization) and northern areas are covered by catch quotas. These quotas are set by coastal states (Canada and EEC) for waters within 200 miles and by NAFO for waters beyond national jurisdiction. In addition to quotas, there are controls on effort, gear, area and season.

Table 6
Northeast Atlantic (Area 27)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Freshwater and diadromous	Norway, UK Scotland, Faeroe Is, Finland	56	50	60	145	111	125	175	226	231	253	254	?
Plaice	Netherlands,Denmark, UK England Wales	184	168	147	191	182	185	192	192	200	184	167	F
Common sole	Netherlands, France, Belgium	31	23	29	30	28	30	28	29	41	43	41	F
Other flatfish	Iceland,Spain, Denmark, Norway, France	159	128	148	158	140	157	170	179	154	164	140	F
Tusk	Norway, Iceland Faeroe Is.	32	34	42	41	44	41	34	43	40	42	39	?
Atlantic cod	Iceland, Norway, Russian Fed.,Denmark.	1831	1714	1524	1325	1368	1468	1330	1146	957	918	928	O
Ling	Norway,France, Spain, Iceland	68	73	84	84	85	87	81	82	75	65	67	?
Haddock	UK Scotland, Iceland Norway, Russian Fed.	602	385	312	320	364	363	303	239	183	165	181	O
Saithe (Pollock)	Norway, Iceland, Faeroe Is., France	647	537	439	401	388	409	390	379	376	377	358	F
Polar cod	Russian Fed.	193	18	29	2	1	0	0	0	0	0	21	?
Norway pout	Denmark,Norway, Faeroe Is.	523	541	499	320	285	339	277	352	296	303	451	M-F

Table 6 (continued)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Blue whiting (Poutassou)	Russian Fed., Norway, Denmark, Spain, Lithuania.	41	406	732	694	804	693	661	651	575	433	465	M-F
Whiting	UK Scotland, France, Netherlands, Ireland.	205	223	176	118	113	118	119	94	92	89	89	F
European hake	Spain, France, Portugal.	97	76	66	72	72	72	72	67	73	70	75	F
Other gadoids	France, Spain, Portugal	42	53	53	53	67	55	53	47	46	50	52	?
Sandeels	Denmark, Norway, Faeroe Is.	358	637	688	931	973	857	1042	1134	754	1021	1060	F
Atlantic redfishes	Iceland, Norway, Germany	155	312	290	226	253	209	222	175	189	191	178	F
Monk (Angler fish)	France, Spain, UK Scotland	35	39	53	55	52	54	55	54	56	54	58	?
Other demersal fish	France, Iceland, Faeroe Is., Spain, Norway, Denmark.	149	166	122	169	145	194	199	189	158	155	151	?
Capelin	Norway, Iceland Russian Fed.,Faeroe Is.	1668	2921	2425	1251	1292	1022	1031	777	796	1200	2078	F
Atlantic horse mackerel	Netherlands, Norway, Ireland, Denmark, Spain.	279	235	169	288	229	261	357	384	440	409	455	M
Atlantic herring	Norway, Sweden,Denmark, Iceland, UK Scotland, Netherlands, Finland.	1373	784	837	1320	1307	1305	1401	1356	1214	1110	1259	M-D

Table 6 (continued)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
European sardine (pilchard)	Portugal, Spain	161	170	220	190	199	182	175	173	185	180	204	F
Sprat	Denmark,USSR,Poland	402	760	427	216	200	246	255	209	191	255	269	M
European anchovy	Spain, France	35	39	17	15	11	18	17	17	18	17	18	F
Atlantic mackerel	UK Scotland, Norway, Ireland, Netherlands	482	724	589	565	537	616	622	511	585	612	743	F
Tunas	Spain, Portugal	53	49	45	53	53	59	62	48	50	39	43	F
Other pelagic fish	Spain, Portugal	57	69	38	52	52	39	50	51	54	57	61	?
Sharks	France, Norway, UK Scotland	71	64	57	66	65	70	65	61	65	58	58	?
Skates	France, UK England Wales, UK Scotland	32	26	27	26	25	30	28	26	23	20	23	Some species:D Others: M
Other fish	Portugal, France, USSR, Norway	204	155	149	89	62	30	55	45	51	48	58	?
Total fishes		10225	11579	10493	9466	9507	9334	9521	8936	8168	8582	10044	
Crabs	France, UK England, Wales, UK Scotland	25	33	35	36	34	38	36	33	35	35	35	?
Norway lobster	UK Scotland, France	36	40	46	53	51	54	54	49	48	48	45	F
Northern prawn	Norway, Iceland	20	37	107	126	127	115	105	113	133	135	137	F

Table 6 (continued)

Stock	Main fishing countries 1992	1970 -74	1975 -79	1980 -84	Catches ('000t) 1985 -87	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Common shrimp + Crangon	Netherlands, Germany.	40	31	24	21	20	22	20	24	15	24	26	F
Other crustaceans	Spain, France.	17	11	6	8	7	7	9	8	7	8	7	?
Total crustaceans		138	152	218	244	239	236	224	227	238	250	250	
Oysters	France, Spain, Ireland.	70	99	103	141	146	135	135	144	145	138	130	F
Blue mussel	Spain, Denmark, Netherlands, Germany, France.	293	329	483	508	521	530	489	468	458	476	453	F
Scallops	Iceland,UK Scotland, France.	41	44	49	62	61	89	64	48	58	46	58	F
Common cockle	UK England Wales, France, UK Scotland.	32	31	21	30	25	50	34	28	33	50	38	M
Cephalopods	France,Portugal, Spain.	36	25	38	40	26	44	42	49	56	43	47	U
Other molluscs	Portugal,France,Spain	39	28	24	36	30	37	50	45	39	43	53	?
Total molluscs		511	556	718	817	809	885	814	782	789	796	779	
Others a/		4	3	0	0	0	0	0	0	0	0	0	
Total area		10878	12290	11429	10527	10555	10455	10559	9945	9195	9628	11073	

a/ Including starfish, purple sea urchin and aquatic invertebrates n.e.i.

Management measures. The management regime of this region is in a period of transition, with the establishment of entalled jurisdiction by the coastal state, and the slow development of a common fishery policy by the EEC. A variety of measures, principally catch quotas, and controls on mesh sizes and sizes of fish have been set.

Table 7
Western Central Atlantic (Area 31)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Freshwater and diadromous fishes	USA,Venezuela	11	7	10	12	11	13	11	9	4	3	1	F
Snappers	Mexico,Venezuela USA, Cuba	21	19	22	24	24	26	23	23	36	29	27	M-F
Groupers	Mexico,USA,Venezuela.	24	22	26	24	22	24	26	27	30	26	22	
Grunts	Venezuela, Cuba	29	23	8	8	9	9	7	8	8	9	9	O
Sciaenids	Venezuela,USA,Mexico	37	39	31	29	31	29	28	29	28	29	28	
Sharks and Rays	Mexico,Venezuela,USA	9	12	21	28	25	25	31	33	30	27	30	M
Other demersal fishes	Mexico, Venezuela USA, Cuba	36	38	51	33	28	33	34	37	38	39	39	O
Mullets	Venezuela,Mexico,USA.	27	23	31	29	27	31	31	34	35	35	34	? a/
Atlantic menhaden	USA	51	81	83	34	34	26	34	31	34	51	27	F
Gulf menhaden	USA	571	636	803	768	828	907	639	583	520	551	433	F
Round sardinella	Venezuela	44	40	50	73	84	87	62	72	59	76	76	M
Other clupeoids	USA, Cuba	20	15	11	7	5	5	6	9	10	9	8	M
King and Spanish mackerels	Mexico,Trinidad &Tobago, Venezuela	21	23	23	22	20	23	21	23	24	27	25	M-F
Other tunas	Venezuela, USA	32	34	58	55	56	42	46	54	42	53	55	M

Table 7 (continued)

Stock	Main fishing countries 1992	Catches ('000) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Other pelagic fish	Venezuela, USA, Mexico, Barbados	21	24	27	27	24	25	33	29	37	33	35	M
Unidentified fishes	Mexico, Guyana, Venezuela, Cuba	130	157	243	262	276	256	252	255	300	351	328	
Total fishes		1084	1193	1498	1435	1504	1561	1284	1256	1235	1348	1177	
Crabs	USA, Mexico	35	40	49	56	51	56	65	55	48	55	61	U
Spiny lobsters	Cuba, Bahamas	20	22	24	27	28	26	25	27	24	30	28	F-O
Shrimps	USA, Mexico	170	166	172	181	202	181	165	175	180	186	171	
Other crustaceans	St Kitts and Nevis, Virgin Is. Br.	1	1	0	1	1	2	2	0	1	1	0	
Total crustaceans		226	229	245	265	282	265	257	257	253	272	260	
Oysters	USA, Mexico	161	172	206	179	186	173	158	152	127	131	155	Culture potential
Cephalopods	Mexico, Korea Rep.	5	7	10	13	13	12	12	18	20	20	22	U
Calico scallop	USA	9	14	150	83	17	85	122	68	11	3	0	M-F
Other molluscs	Venezuela, USA	17	33	38	49	41	49	44	56	54	39	42	U
Total molluscs		192	226	404	324	257	319	336	294	212	193	219	
Others		1	1	1	1	2	1	1	1	1	1	1	
Total area		1503	1649	2148	2025	2045	2146	1878	1808	1701	1814	1657	

a/ Probably moderately to heavily fished if the discards by shrimp trawlers are taken into account.

Table 8
Eastern Central Atlantic (CECAF - Area 34)

CECAF Sub-areas	Stock	Main fishing countries 1991	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992a/	State of exploitation
NORTH														
All sub-areas	Cephalopods	Korea Rep., Spain	173	146	131	113	116	101	116	134	144	186	190	O
34.1.1 + 34.1.3	Octopus	Morocco, Spain	94	79	79	65	69	58	67	71	80	108	120	O
34.1.3 + 34.3.1	Cuttlefish	Senegal,Spain, Honduras,Italy	30	25	22	18	16	17	18	21	20	21	36	O
34.1.1 + 34.1.3	Squids	Morocco	14	16	10	7	4	9	10	8	12	16	25	O
34.1.1 + 34.1.3	European pilchard	Former USSR, Morocco, Spain Romania	392	630	484	679	359	715	908	1112	1113	957	746	F
34.1.3 + 34.3.1	Sardinellas	Former USSR, Senegal,Guinea, Romania	162	173	155	231	125	271	293	331	421	427	330F	F-O
34.3.1	Bonga	Gambia, Senegal,	27	17	16	15	16	7	15	24	21	26	24	?
34.1.3 + 34.3.1	Horse mackerels	Former USSR,Senegal, Romania	299	313	290	198	58	329	310	263	237	227	188	F highly variable
34.1.3 + 34.3.1	Mackerels	Fromer USSR, Senegal, Romania	87	81	83	38	12	86	278	262	134	96	52	F highly variable
34.1.1	Hakes	Spain,Morocco	10	20	6	11	10	12	10	14	13	13	14	O
34.1.3 + 34.3.1	Hakes	Spain,Former USSR	52	39	22	34	2	6	6	17	14	12	14	O-?

Table 8 (continued)

CECAF Sub-areas	Stock	Main fishing countries 1991	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992a/	State of exploitation
34.1.3+34.3.1	Dentex, Sea breams	Senegal, Former USSR, Mauritania	98	53	33	28	26	39	31	31	30	42	30 F	O
Others			869	611	493	513	377	462	525	526	642	443	499	
Total North			2307	2203	1824	1950	1190	2112	2587	2814	2881	2574	2268	
SOUTH														
34.3.3+34.3.4+ 34.3.5+34.3.6	All prawns and shrimps	Cameroon,Nigeria Ghana,Gabon	4	11	20	21	19	21	21	23	25	25	36 F	F
All sub-areas	Demersal		155	181	173	135	142	158	120	128	131	111	125 F	F
34.3.4	Sardinellas	Ghana, Côte d'Ivoire	57	55	69	115	112	113	110	105	90	86	169	F-O-R
34.3.6	Sardinellas	Congo	6	6	11	12	12	12	15	12	11	10	10	M
All sub-areas	Bonga	Nigeria,Sierra Leone, Cameroon, Côte d'Ivoire,Gabon	46	51	86	97	84	101	100	108	77	74	100	F Côte d'Ivoire:D
Others			273	291	256	321	271	390	368	368	468	380	164	
Total South			541	595	615	701	640	795	734	744	802	686	604 F	

Table 8 (continued)

CECAF Sub-areas	Stock	Main fishing countries 1991	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992a/	State of exploitation
OCEANIC 34.1.2+34.2.0+ 34.3.2+34.4.1+ 34.4.2			56	62	119	10	7	9	10	9	5	4	0 F	?
TUNA 34.0 b/		Spain,France, Ghana,Japan	204	258	307	274	256	265	287	295	342	359	307	M-F
UNKNOWN AREA 34.9.0				120	181	436	992	147	105	91	65	282	80	
Total CECAF Area			3108	3238	3046	3361	3085	3328	3723	3953	4095	3905	3259	

a/ Data should be considered provisional
b/ Catches in whole areas; see also Table 21.

Table 9
Mediterranean and Black Sea (area 37)

Sector a/	Species groups	Main countries 1992	Remarks	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992
Balearic	Demersal	Spain	Trawl only	26.9	37	43.5	34.5	34.7	34.8	24	34.8	31.6	29.4	28.9
37.1.1	Coastal pel.	Algeria		93	132	154	161	159	157	174	172	169	148	175
	Miscel. b/	Morocco		10	23	29	19	22	15	18	17	17	15	16
Gulf of Lions	Demersal		Finfish	4	7	9	8	6	12	9	9	9	11	13
37.1.2	Coastal pel.	France	Sardine	20	19	26	34	21	44	40	41	38	35	36
	Miscel. b/	Spain		9	5	2	3	2	6	3	3	3	3	2
Sardinia	Demersal		Trawl only	33	23	24	29	29	33	31	21	20	24	27
37.1.3	Coastal pel.	Italy		59	39	37	28	36	30	21	18	14	16	22
	Miscel. b/	Tunisia		15	12	13	15	15	16	14	12	9	9	8
Adriatic	Demersal	Italy	Trawl only	18	20	19	19	20	22	21	18	19	18	22
37.2.1	Coastal pel.	Yugoslavia		80	92	123	95	93	94	82	85	75	67	52
	Miscel. b/			31	37	34	19	31	15	14	12	11	10	12
Ionian	Demersal	Italy, Tunisia,	Trawl only	31	42	50	73	74	66	70	68	71	71	75
37.2.2	Coastal pel.	Libya, Greece,		32	44	51	62	66	62	62	59	53	52	54
	Miscel. b/	Albania		16	37	41	37	37	36	35	38	35	34	19
Aegean	Demersal			16	22	27	40	39	39	41	47	43	51	61
37.3.1	Coastal pel.	Greece		23	36	46	63	59	65	60	70	61	73	86
	Miscel. b/	Turkey		8	10	9	9	8	8	11	11	13	15	13
Levant	Demersal	Egypt , Turkey	Finfish	10	12	13	18	14	16	20	28	29	28	37
37.3.2	Coastal pel.	Israel, Cyprus.		9	9	14	19	19	17	19	22	24	30	36
	Miscel. b/			4	3	4	12	5	19	16	12	10	10	14
Whole	Demersal			139	163	185	222	217	223	216	225	222	232	264
Mediterranean	Coastal pel.			316	370	451	462	453	468	459	466	433	422	460
	Miscel. b/			93	128	132	114	120	114	110	106	98	97	84
Total Mediterranean				549	661	767	798	790	805	785	797	753	751	809

Table 9 (continued)

Sector a/	Species groups	Main countries 1992	Remarks	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992
Sea of Marmara 37.4.1	Demersal	Turkey		...	...	3	6	5	7	7	6	8	11	4
	Coastal Pel.			...	...	31	39	43	47	43	31	31	26	32
	Miscel. b/			...	...	0	0	0	0	2	0	0	0	0
Black Sea 37.4.2	Demersal	Turkey		...	...	32	42	36	45	48	42	31	31	32
	Coastal Pel.	Former USSR		...	...	621	590	664	558	726	392	243	160	237
	Miscel. b/			...	...	4	5	3	8	6	7	5	18	7
Sea of Azov 37.4.3	Demersal	Former USSR		...	...	8	5	7	7	3	2	1	1	0
	Coastal Pel.			...	...	31	16	33	23	9	0	0	1	3
	Miscel. b/			...	...	97	86	105	100	42	43	8	13	5
Whole Black Sea	Demersal			24	32	42	53	49	58	58	49	40	42	37
	Coastal pel.			294	369	683	645	740	628	779	423	274	186	272
	Miscel. b/			99	73	101	91	108	108	50	50	12	31	12
Total Black Sea				417	474	826	789	897	794	887	522	326	259	321
Whole area 37.0	Tunas			23	30	58	67	62	67	78	62	66	68	57
Whole area 37.0	Others c/			126	166	230	306	282	305	339	342	364	360	391
Totals	Demersal			164	195	227	275	266	280	274	275	262	275	301
	Coastal pel.			610	739	1134	1107	1193	1097	1237	889	707	607	732
	Miscel. b/			192	201	233	204	228	221	160	155	110	128	97
	Tunas			23	30	58	67	62	67	78	62	66	68	57
	Others c/			126	166	230	306	282	305	339	342	364	360	391
Total area				1115	1331	1881	1960	2031	1971	2089	1722	1509	1437	1577

a/ GFCM statistical divisions (boundaries given in GFCM Statistical Bulletins).
b/ Miscellaneous: diadromous, marine fishes n.e.i.
c/ Others: crustaceans, molluscs, other aquatic animals.

Table 19
Southwest Atlantic (Area 41)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Argentine hake	Argentina, Uruguay, Brazil	144	318	329	406	381	439	434	398	421	521	455	F
Southern blue whiting	Argentina, Poland, Spain	0	11	131	103	104	85	101	132	194	155	132	U-M
Atlantic croaker	Brazil, Uruguay, Argentina	54	84	80	65	70	71	67	61	55	63	70	M-F
Weakfishes	Brazil, Argentina, Uruguay	40	56	77	62	66	60	58	56	50	48	54	M-F
Sardinella	Brazil	174	136	127	97	126	91	65	78	32	64	65	O
Anchoita	Argentina	28	20	18	18	16	20	21	21	14	21	19	U
Red shrimp	Argentina	0	0	11	10	7	3	18	12	10	8	24	F-O
Other prawns and shrimps	Brazil	48	54	52	56	57	57	48	49	51	43	45	F-O
Squids and octopuses	Korea Rep., Japan, Other Asia, Argentina, Russian Fed.,Spain	4	44	150	594	411	764	681	762	553	691	702	Patagonian shelf: F-O Elsewhere: U
Other demersal Patagonian shelf	Argentina, Spain, Russian Fed.	2	11	24	83	74	96	125	77	70	47	44	M
Others		324	333	360	644	608	714	700	620	578	544	534	
Total area		818	1067	1359	2138	1920	2400	2318	2266	2028	2205	2144	

Table 11
Southeast Atlantic (Area 47)

Species	Stocks ICSEAF divisions	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Hakes	1.3+1.4	Bulgaria, Spain	414	280	162	186	231	136	212	137	44	7	10	O
	1.5	Spain, S. Africa	231	162	116	151	150	163	97	174	56	8	12	O
	1.6	S. Africa	164	106	89	97	109	104	90	83	76	85	84	O-R
	2.1+2.2	S. Africa	55	53	43	49	51	41	45	51	98	52	52	R
	Unknown sub-areas	Namibia	...	...	...	12	...	22	24	14	28	30	49	
Kingklip	All sub-areas	S. Africa, Spain, Japan,	12	10	8	13	17	14	9	8	4	2	2	O
Large-eyed dentex	1.3+1.4		15	23	6	1	1	0	1	1	1 ...	...		D: mid 1970s R: no sign
Panga	1.6+2.1+2.2	Japan	8	6	2	2	2	2	2	2	2	2	1	F
Sardinella	1.1+1.2+1.3	Angola	92	125	205	145	165	108	133	106	57	57	15	M
Cunene horse mackerel	1.1+1.2	Russian Fed., Angola		31	45	47	53	54	39	62	44	36	46	
	1.3	Russian Fed., Angola	159	190	60	64	55	51	91	96	72	51	58	F-O
Cape horse mackerel	1.3+1.4+1.5	Russian Fed.,Ukraine S. Africa, Estonia,Lithuania	161	386	283	474	448	518	539	439	200	329	226	M-F
	1.6+2.1+2.2	S.Africa	32	52	17	40	32	39	41	59	57	34	34	M-F
	Unknown sub-areas	Namibia	...	...	...	0	...	0	1	1	85	83	116	

Table 11 (continued)

Species	Stocks ICSEAF divisions	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Pilchard	1.3+1.4+1.5		462	279	47	65	53	67	66	80	0 ...	...		D
	1.6	S. Africa	68	85	44	37	36	41	42	35	57	52	53	D
	Unknown sub-areas	Namibia	...	...	...	...	...	...	...	...	89	69	81	
Anchovy	1.3+1.4+1.5	S. Africa	211	212	190	128	16	376	118	79	...	...	...	F-O
	1.6	S. Africa	233	244	315	405	300	593	565	294	150	151	347	F
	Unknown sub-areas	Namibia	...	...	...	...	...	...	...	...	51	17	39	
Chub mackerel	1.1+1.2+1.3+ 1.4+1.5		3	77	33	22	28	31	11	11	7	3	...	F
	1.6+2.1+2.2	S.Africa	58	2	3	7	3	5	8	17	12	14	4	F-D
Others			377	455	615	368	376	366	368	352	215	189	229	
Total area			2755	2778	2283	2313	2126	2713	2502	2101	1405	1271	1458	

Table 12
Western Indian Ocean (Area 51)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Shad (Hilsa)	Pakistan	11	9	4	2	2	2	2	2	1	1	1	
Giant sea perch	Pakistan	1	1	1	1	1	1	1	0	0	0	0	
Flat fishes	India	12	10	14	13	15	12	8	21	23	20	25	
Bombay duck	India	94	122	100	100	95	88	98	116	124	142	154	
Sea catfishes	Pakistan,India	60	58	52	46	45	45	57	48	49	58	56	
Lizard fishes	India, Egypt	2	8	8	7	6	8	7	10	10	18	20	
Pike congers	Pakistan,India	9	17	11	8	10	7	6	7	13	13	14	
Groupers	UAE, Saudi Arabia, Pakistan, Oman	4	4	12	21	20	20	25	21	23	23	25	M-F
False trevally	India	5	3	6	4	5	3	5	6	8	4	4	
Snappers	UAE, Saudi Arabia	4	5	7	9	9	10	10	10	9	10	10	
Ponyfishes	India	16	7	14	11	18	10	6	11	11	9	9	
Grunts	Pakistan	3	4	5	8	8	7	10	7	7	8	7	
Emperors (Lethrinids)	Tanzania,UAE, Saudi Arabia, Mauritius	6	12	18	35	34	34	42	38	38	42	44	
Croakers, drums	India, Pakistan	39	101	110	160	149	152	151	199	218	238	241	
Goatfishes	India	3	5	9	16	12	9	22	20	16	27	27	
Porgies, seabreams	Oman, Korea Rep., Pakistan	8	10	13	18	17	21	21	15	17	20	18	
Threadfins	Yemen, Oman,Tanzania	1	1	1	2	2	2	2	2	3	3	3	
Other identified demersal percom.	India, Tanzania, UAE, Italy	14	26	25	33	27	31	44	43	40	74	75	
Demersal percom. n.e.i.	SriLanka, Egypt, Oman	32	44	49	29	36	20	18	31	33	33	26	
Black pomfret	Pakistan	4	5	3	2	4	1	1	1	1	1	1	
Butter fishes	India, Pakistan	23	28	36	27	23	25	29	31	26	34	29	
Carangids	India, Pakistan, UAE, Sri Lanka, Egypt	28	53	59	94	73	80	88	162	171	196	223	
Sardinellas	India, Pakistan, UAE	163	237	266	246	242	213	237	286	316	223	229	
Anchovies	India, Pakistan	31	40	53	47	40	34	55	56	94	89	89	U-M

Table 12 (continued)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Wolfherrings	India, Pakistan	7	11	16	14	12	12	12	17	22	10	10	
Mixed clupeoids	India,Pakistan, Sri Lanka	70	60	100	103	79	109	130	125	142	166	178	
Other identified pelagic percom.	India, Sri Lanka, Oman, Pakistan,	22	29	41	53	42	46	64	70	49	67	76	
Pelagic percom. n.e.i.	Yemen, Oman	188	143	115	83	79	88	85	77	79	102	89	
Seerfishes (kingfish)	India, Oman, Pakistan, UAE	22	27	44	75	75	82	77	66	59	64	70	
Skipjack	Spain,Maldives, France, Japan	35	28	51	165	137	156	191	219	202	201	251	
Yellowfin	France, Spain, Other Asia, Pakistan. Panama	25	28	45	123	107	115	166	136	158	151	208	
Longtail tuna	Iran, Oman, UAE	12	14	12	36	31	37	40	36	33	29	27	
Kawakawa	India, Maldives,UAE	2	3	16	24	25	20	30	17	21	21	22	
Big-eye	Other Asia, Korea R., Japan,France	12	20	24	35	35	37	40	33	33	28	29	
Albacore	Other Asia	8	8	10	8	8	9	11	6	19	24	8	
Southern bluefin	Japan	5	3	5	3	2	2	3	3	1	1	1	
Billfishes	Sri Lanka,Pakistan, Other Asia	4	4	5	12	11	13	13	12	10	12	12	
Other tuna	India,Russian Fed., Madagascar	24	26	24	37	32	45	36	50	66	64	67	
Hairtails	India	21	37	37	52	56	56	43	40	38	37	42	
Indian mackerel (Rastrelliger)	India	113	66	49	98	75	77	75	163	123	91	84	
Sharks, rays	Pakistan, India, Sri Lanka	101	108	99	92	89	92	96	96	97	106	116	
Other fish	India,Iran,Pakistan, Madagascar, Sri Lanka	256	348	360	629	588	607	621	762	624	660	720	
Total fishes		1500	1773	1929	2581	2376	2438	2678	3071	3027	3120	3340	

Table 12 (continued)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Crabs	Bahrain,Madagascar, Pakistan	0	1	2	2	2	2	2	3	3	2	3	
Lobsters	Yemen,Oman,Pakistan	4	5	3	5	5	5	5	5	6	6	4	
Shrimps	India,Pakistan,Madagascar Iran, Mozambique	201	225	222	243	239	231	245	237	256	317	294	F-O
Other crustaceans	India, Sri Lanka	8	16	21	11	10	11	11	14	15	24	25	
Total crustaceans		213	247	248	261	256	249	263	259	280	349	326	
Cuttlefishes	Pakistan, Oman,Yemen	10	13	5	6	8	5	4	6	10	9	9	
Other cephalop. and bivalves	India, Iran, Other Asia	3	9	13	32	20	32	41	43	32	67	70	
Total molluscs		13	22	18	38	28	37	45	49	42	76	79	
Others		0	0	0	1	0	1	1	1	1	1	2	
Total area		1726	2042	2195	2881	2660	2725	2987	3380	3350	3546	3747	

Table 13
Eastern Indian Ocean (Area 57)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Toli shad	Bangladesh	0	0	11	95	84	104	106	111	111	115	126	
Giant seaperch	Indonesia	1	1	2	6	5	6	6	8	7	6	8	
Flatfishes	India	2	2	3	5	5	5	4	9	7	6	6	
Sea catfishes	India	17	20	29	37	40	34	33	45	45	52	56	
Lizard fish	Thailand,India	2	5	6	6	6	6	4	6	7	8	8	
False trevally	India	3	4	4	2	2	3	3	3	2	2	3	
Sillago-whitings	Thailand,Australia	1	2	3	4	4	5	5	4	6	6	3	
Ruffs	Australia	5	4	4	6	6	6	5	4	5	6	5	
Snappers	Indonesia	2	4	5	7	6	6	7	8	8	10	10	
Threadfin breams	Thailand,Malaysia,Indonesia	1	5	10	10	10	11	9	10	11	19	19	F-0
Ponyfishes	India, Indonesia	28	34	40	38	32	38	39	45	49	48	49	
Croakers	India,Thailand, Malaysia	21	29	40	51	51	53	55	53	43	54	56	
Goatfishes	India	2	4	5	7	8	9	3	10	14	15	12	
Halfbeaks,needlefish	India, Indonesia	1	9	8	12	11	15	14	7	7	11	8	
Barracudas	Thailand,India, Indonesia	2	3	6	8	7	8	9	9	11	13	13	
Threadfins	India, Indonesia	4	11	8	10	8	10	11	13	8	11	12	
Carangids	Indonesia,Thailand,India	15	26	60	92	81	91	115	98	107	114	124	
Butterfishes	India	6	8	14	14	15	22	10	12	10	12	14	
Sardinella, sardines	India, Thailand, Indonesia	4	66	89	107	115	135	98	96	98	97	121	
Anchovies	India,Thailand	15	24	36	22	28	26	17	15	18	31	26	
Wolfherrings	India	5	8	11	17	21	17	16	17	18	22	21	
Other Clupeoids	Indonesia,Malaysia,India	57	32	70	62	59	68	68	60	68	76	66	
Kingfish, seerfishes	India, Indonesia	10	16	22	35	25	28	51	50	33	40	43	
Skipjack	Indonesia	3	6	11	14	12	13	14	19	15	17	17	
Yellowfin	Indonesia,Other Asia	5	10	11	14	12	14	13	18	13	12	11	
Bigeye	Other Asia	4	12	13	12	12	12	14	8	8	8	4	
Albacore	Other Asia	3	3	5	20	20	33	30	13	9	11	9	
Southern bluefin	Australia, Japan	21	19	24	18	20	17	16	11	10	6	7	F
Marlins, billfishes, swordfish	Other Asia	2	3	5	5	6	5	4	3	2	2	1	
Other tuna	Indonesia,Thailand, India	8	16	38	50	38	57	52	66	78	98	108	

Table 13 (continued)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Hairtails	India, Indonesia	23	31	34	31	36	33	28	19	25	23	22	
Mackerels (Rastrelliger)	Thailand,Indonesia, Malaysia, India	15	37	110	112	104	109	107	113	127	151	150	
Sharks and rays	India, Indonesia, Australia	31	38	50	60	53	58	78	63	51	59	62	
Other, identif. fish	India,Thailand,Malaysia, Indonesia, Australia	35	60	101	154	123	154	191	199	198	226	236	
Marine fishes n.e.i.	Myanmar, Thailand,Bangladesh Malaysia,India,Indonesia	457	682	917	1056	1049	1067	1065	1142	1207	1313	1353	
Total fishes		811	1234	1805	2199	2114	2278	2300	2367	2436	2700	2789	
Sand and mud crabs	Thailand, Indonesia	0	4	8	10	10	10	10	10	8	9	9	
Lobsters	Australia	12	14	16	17	16	17	18	18	15	14	18	
Penaeid shrimps	Malaysia, India, Indonesia, Thailand	3	30	67	80	67	67	98	109	110	130	172	F-O
Sergestid shrimps	Malaysia, Thailand	0	2	11	9	9	8	8	9	8	8	8	
Other crustaceans	Bangladesh, India, Indonesia	29	44	70	95	97	115	89	90	99	93	96	
Total crustaceans		44	94	172	211	199	217	223	236	240	254	303	
Abalones	Australia	6	5	7	6	7	6	6	5	5	5	5	
Oysters and mussels	Australia,Malaysia	0	1	6	9	6	9	13	13	8	5	5	
Scallops	Australia	4	4	18	9	12	9	7	2	2	8	25	
Cockles and clams	Malaysia,Indonesia,Thailand	0	27	109	72	73	71	70	70	62	74	79	
Cephalopods	Thailand, Malaysia, India	2	12	24	48	33	45	53	79	40	53	54	
Other molluscs	Australia, Indonesia	0	0	1	4	6	7	3	3	1	1	1	
Total molluscs		12	49	165	148	137	147	152	172	118	146	169	
Jelly fishes	Malaysia,Indonesia,Thailand	0	2	29	25	64	32	3	2	1	1	1	
Total area		867	1379	2171	2583	2514	2674	2678	2777	2795	3101	3262	

Table 14
Northwest Pacific (Area 61)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	Sate of exploitation
Salmon	Japan,Russian Fed.,	186	230	233	294	239	284	251	375	348	476	306	D-R
Alaska pollack	Japan,Russian Fed., Poland,Korea Rep.,	3014	3564	3618	4966	5154	5009	5108	4827	4207	3521	3529	F
Other demersal	Japan,Russian Fed., China, Korea Rep.,Other Asia, Hong Kong	1683	2072	1830	1973	2213	1994	1807	1852	1974	1862	1824	F-O
Pacific saury	Japan, Russian Fed., Other Asia	283	334	235	286	251	227	347	331	436	402	382	
Japanese jack mackerel	Japan, Korea Rep.	192	116	108	196	122	201	274	212	245	245	258	
Pacific herring	Russian Fed.,	465	248	145	208	249	255	213	118	109	120	120	
Japanese pilchard	Japan,Russian Fed., China, Korea Rep.	157	1433	3959	5161	5191	5321	5429	5143	4732	3774	2489	F
Japanese anchovy	Japan,China, Korea Rep.	441	356	349	338	412	308	304	316	536	614	663	
Chub mackerel	Japan,China,Korea Rep., Other Asia	1554	1789	1354	1190	1479	1133	1138 1/	981	612	618	669	
Largehead hairtail	China,Korea Rep.,Japan, Other Asia	673	571	657	576	566	556	531	591	655	706	759	F
Tunas, billfishes a/	Japan, China, Other Asia	384	419	449	487	481	454	534	543	627	637	564	F

Table 14 (continued)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	Sate of exploitation
Other small pelagic	China, Japan, Other Asia, Korea Rep.	387	523	758	942	933	1002	910	987	1096	1113	1018	
Marine fishes n.e.i.	China,Korea Dem,Japan, Korea Rep.,Hong Kong, Other Asia	2844	3522	3808	4357	4186	4272	4661	4767	4710	4740	5285	
Japanese flying squid	Japan, Korea Rep.	425	285	267	209	128	243	206	278	285	352	534	F
Others		1872	2499	2964	4405	4016	4506	4881	4929	5102	5122	5799	
Total area		16456	19857	22630	25588	25620	25765	26594	26250	25674	24302	24199	

a/ Includes skipjack tuna, larger tunas, smaller tunas and billfishes.

Table 15
Northeast Pacific (Area 67)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Salmons	USA, Canada	197	219	354	387	396	318	340	446	437	441	381	F
Pacific halibut	USA, Canada	25	14	19	40	41	42	43	39	37	34	35	F
Yellowfin sole	USA	56	76	86	187	179	183	219	153	150	71	124	M
Other flatfishes	USA, Canada	172	112	118	143	166	126	179	110	155	85	139	M
Pacific cod	USA	79	62	112	197	172	208	245	222	261	263	260	M
Alaska pollack	USA, Korea Rep.	1063	888	1086	1553	1605	1714	1550	1494	1529	1372	1463	F
North Pacific hake	USA	169	163	95	205	186	298	199	241	184	31	56	M
Pacific ocean perch	Canada,USA	109	41	26	31	32	34	33	32	49	37	46	D
Sable fish	USA	47	28	24	43	40	48	52	45	43	41	37	M
Pacific herring	USA, Canada	114	101	78	81	68	85	84	85	82	88	101	
King crabs	USA	40	53	32	11	12	13	10	12	15	13	9	D
Pacific snow crabs	USA	31	52	39	56	50	52	66	75	97	162	159	F
Pacific oceanic shrimps	USA	54	67	22	29	28	32	33 /	36	26	20	37	F
Others		236	184	260	277	250	302	302	296	326	308	301	
Total area		2392	2060	2351	3240	3225	3455	3355	3286	3391	2966	3148	

Table 16
Western Central Pacific (Area 71)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Demersal fish	Indonesia,Philippines Thailand, Malaysia	491	612	613	746	734	756	764	795	793	839	747	F
Coastal small pelagic fish													
Mackerels (Rastrelliger)	Indonesia,Philippines Thailand, Malaysia	222	227	253	311	305	306	301	322	305	288	280	
Round scads	Philippines,Indonesia, Thailand, Malaysia	264	343	275	344	357	364	312	363	415	491	511	
Sardinellas	Indonesia,Philippines, Thailand	175	341	392	362	320	341	394	456	475	531	566	
Anchovies	Thailand, Indonesia, Philippines,Malaysia	148	166	209	286	252	264	289	316	336	324	304	M
Total coastal small pelagics		809	1077	1129	1303	1234	1275	1296	1457	1531	1634	1661	
Coastal larger pelagic fish													
King/Spanish mackerels	Indonesia,Malaysia, Philippines, Thailand	55	61	79	81	83	84	83	85	86	90	84	
Smaller tunas a/	Philippines,Thailand Malaysia	68	103	180	277	238	260	324	321	305	299	298	M
Total coastal larger pelagics		123	164	259	358	321	344	407	406	391	389	382	

Table 16 (continued)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Skipjack tuna	Indonesia,Philippines	/ 42	70	99	156	151	164	170	159	199	220	211	F
	Major oceanic countries c/	28	44	47	39	42	34	39	40	40	49	42	F
	Non-coastal countries d/	103	156	227	355	363	346	449	412	471	602	454	F
Total skipjack tuna		173	270	373	550	556	544	658	611	710	871	707	
Yellowfin tuna	Indonesia,Philippines	48	62	77	97	94	85	93	117	161	165	127	see
	Major oceanic countries c/	2	6	8	8	4	8	13	11	12	11	12	tuna
	Non-coastal countries d/	27	56	99	121	116	167	102	145	155	161	199	review
Total yellowfin tuna		77	124	184	226	214	260	208	273	328	337	338	
Penaeid shrimps	Thailand, Indonesia, Malaysia, Philippines	195	216	206	213	203	207	227	257	277	329	303	F-O
Other shrimps and prawns	Vietnam,Indonesia Philippines,Thailand	83	135	139	171	153	166	190	197	206	215	227	
Total shrimps and prawns		278	351	345	384	356	373	417	454	483	544	530	
Cephalopods b/	Thailand, Philippines, Indonesia, Vietnam	95	134	152	211	201	212	225	235	240	262	266	U-M
Total area		4471	5118	5455	6683	6429	6855	7011	7200	7524	7871	7710	

a/ Bullet and frigate tunas, kawakawa and longtail tuna.
Nominal statistics are incomplete, only a few countries separated these species.
b/ Squids, cuttlefish and octopuses.
c/ Fiji, Kiribati, Solomon Islands, etc.
d/ Japan, Korea Rep., USA and Other Asia

Table 17
Eastern Central Pacific (Area 77)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Freshwater and diadromous fishes	USA	2	2	2	2	3	4	6	2	2	2	1	
Demersal fishes	Mexico, USA	79	68	91	68	61	66	73	67	76	75	75	U
Chub mackerel	Mexico, USA	1	15	38	51	50	47	52	60	78	68	38	M
Pacific jack mackerel	USA	19	27	18	11	11	12	10	13	4	2	1	U
Californian pilchard (sardine)	Mexico	58	142	353	455	471	477	446	509	399	467	251	M-F
N. Pacific anchovy	USA, Mexico	92	238	280	135	123	167	119	111	6	21	10	U
Central Pacific anchoveta	Panama	37	104	101	120	85	111	39	121	62	65	70	M-F
Pacific thread herring	Panama	17	19	19	15	5	10	40	18	26	36	33	M-F
Other coastal pelagic fishes	Mexico, USA	7	12	19	17	13	20	19	21	17	17	16	U
Skipjack tuna	USA, Mexico, Japan	56	106	101	82	62	51	86	80	44	41	77	M
N. bluefin tuna	USA	9	8	2	2	5	1	1	1	1	0	1	M
Albacore	Other Asia, Japan, Korea Rep.	15	20	21	27	33	24	26	21	17	12	15	M
Bigeye tuna	Japan, Korea Rep.	42	69	62	87	100	98	80	77	92	91	86	M

Table 17 (continued)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Yellowfin tuna	Mexico,Venezuela, Japan	167	187	144	267	276	271	283	275	257	213	230	F
Other oceanic fish	Japan,USA, Mexico	37	34	32	38	33	43	41	42	47	32	32	U
Unidentif. fishes	Mexico,USA	119	96	136	127	140	118	122	111	179	167	233	
Total fishes		757	1147	1419	1504	1471	1520	1443	1529	1307	1309	1169	
Dungeness and Pacific rock crabs	USA	2	1	0	1	1	2	2	0	0	1	1	U
Shrimps	Mexico,Panama Honduras,Costa Rica	68	58	75	80	82	82	75	79	62	67	69	F
Other crustaceans	Mexico,USA, El Salvador	2	3	11	12	13	18	10	8	8	6	6	
Total crustaceans		72	62	86	93	96	102	87	87	70	74	76	
Squids	USA, Japan Mexico, Korea Rep.	11	14	23	57	36	68	76	81	80	65	40	U
Other molluscs	Mexico,USA	17	15	25	33	31	31	38	44	47	44	44	
Total molluscs		28	29	48	90	67	99	114	125	127	109	84	
Others	USA, Mexico	8	39	46	16	15	19	20	15	15	15	13	
Total area		865	1277	1599	1703	1649	1740	1664	1756	1519	1507	1342	

Table 18
Southwest Pacific (Area 81)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Blue grenadier (Hoki)	New Zealand, Japan, Ukraine	7	49	38	173	187	181	246	210	392	378	350	F
Southern blue whiting (Poutassou)	New Zealand, Japan Ukraine	23	19	13	6	17	14	19	32	42	70	133	?
Orange roughy	New Zealand a/	0	1	42	48	45	49	55	52	48	36	37	F-O
Oreo dories	New Zealand a/	0	9	33	18	14	16	20	17	20	20	20	?
Other demersals	New Zealand, Australia	60	80	121	128	120	122	138	127	176	161	163	
Greenback horse, jack mackerels	Russian Fed., New Zealand, Japan	13	13	23	100	134	135	96	94	105	177	68	?
Other small pelagics	Australia, Japan, New Zealand	12	25	15	20	20	20	22	18	27	20	19	
Snoek	New Zealand, Japan	17	21	30	26	18	36	30	27	29	31	26	?
Sharks and rays	New Zealand, Australia	5	7	13	16	14	16	21	15	17	18	14	?
Other fishes		67	73	68	152	42	165	219	200	61	76	90	
Total fishes		204	297	396	687	611	754	866	792	917	987	920	

Table 18 (continued)

Stock	Main fishing countries 1992	Catches ('000t) 1970/ -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Oysters	Australia, New Zealand	19	20	18	16	15	13	18	16	12	14	11	F
Mussels	New Zealand	2	1	5	19	16	18	25	24	24	44	47	F
Squids	New Zealand, Russian Fed., Korea Rep.	8	37	116	134	102	105	125	205	84	82	123	?
Other molluscs		6	12	6	4	6	3	4	3	3	4	4	
Total molluscs		35	70	145	173	139	139	172	248	123	144	185	
Rock lobsters	New Zealand, Australia	5	4	5	5	5	5	4	4	3	3	3	F-O
Other crustaceans		3	2	3	3	3	3	3	4	4	4	5	
Total crustaceans		8	6	8	8	8	8	7	8	7	7	8	
Others		0	0	0	0	1	1	0	0	1	0	1	
Total area		247	373	549	868	759	902	1045	1048	1048	1138	1114	

a/ Quantities of "Orange roughy" and "Oreo dories" refer to catch of New Zealand only.
Quantities of these species cought by other countries are included under "Other demersals"

Table 19
Southeast Pacific (Area 87)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Chilean hake	Chile	139	194	85	98	74	64	150	156	225	140	64	F
Chilean jack mackerel	Chile, Peru,Russian Fed.,Ecuador	173	776	1845	2738	1961	2682	3246	3655	3828	3955	3390	M
Patagonian hake	Chile	0	9	37	51	3	57	69	57	52	40	38	
Patagonian grenadier	Chile	0	3	22	13	37	132	212	227	128	165	214	
South Pacific breams	Peru, Chile	16	18	20	32	41	48	30	22	17	7	9	
South American pilchard (sardine) Ecuador	Peru, Chile	103	1512	3901	5267	4961	4950	5383	4530	4254	4190	3105	F-O
Chilean herring	Chile	131	31	35	60	38	32	30	164	299	584	452	
Anchoveta (Peruvian anchovy)	Peru, Chile	6959	2251	884	3411	4945	2101	3613	5408	3772	4017	5451	R
East. Pac. bonito	Peru	51	7	18	19	5	19	35	27	40	25	55	
Chub mackerel	Chile,Ecuador,Peru	103	527	412	201	149	174	236	245	402	294	103	M
Squids	Chile, Peru	1	1	2	9	6	5	7	10	21	133	123	M
Others		362	402	677	871	782	727	766	836	936	809	895	
Total area		8038	5731	7938	12770	13002	10991	13777	15337	13974	14359	13899	

Table 20
Southern Ocean (Areas 48, 58 and 88)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Notothenia rossii													
Area 48 b/	Russian Fed.,	101	7	11	1	0	0	0	0	0	0	0	O
Area 58 c/	France,Poland	42	13	5	1	1	0	0	0	0	0	0	O
Notothenia squamifrons													
Area 48 b/	Bulgaria, Poland	0	2	0	1	0	0	2	1	0	0	0	?
Area 58 c/	Ukraine	20	11	7	5	3	3	5	5	3	0	0	F-O
Patagonotothen brevicauda													
Area 48 b/	Bulgaria	0	3	18	13	16	9	13	13	0	0	0	?
Notothenia gibberifrons													
Area 48 b/	UK, England Wal	0	8	7	5	2	3	10	2	0	0	0	F-O
Champsocephalus gunnari													
Area 48 b/	UK, England Wal	3	62	63	32	14	71	36	22	11	0	0	F-O
Area 58 c/	France, Russian Fed.,	16	28	10	10	17	3	0	24	1	0	0	F-O
Other fishes													
Area 48 b/	Russian Fed.,Chile, Ukraine	0	15	17	13	4	5	19	34	32	49	52	
Area 58 c/	Ukraine, France	2	1	1	3	1	4	3	2	0	3	8	
Area 88	Poland	0	0	1	0	0	0	0	1	0	0	0	
Total fishes													
Area 48		104	97	116	65	36	88	80	72	43	49	52	
Area 58		80	53	23	19	22	10	8	31	4	3	8	
Area 88		0	0	1	0	0	0	0	1	0	0	0	

Table 20 (continued)

Stock	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation
Krill													
Area 48	Russian Fed.,Japan, Ukraine, Poland	4	93	253	342	426	347	364	395	345	231	296	U
Area 58	France,Japan	0	27	104	12	16	30	7	0	30	1	0	
Area 88	Japan	0	1	5	2	4	0	0	0	1	0	0	
Total areas													
Area 48		108	190	369	407	462	435	444	467	388	280	348	
Area 58		80	80	127	31	38	40	15	31	34	4	8	
Area 88		0	1	6	2	4	0	0	1	1	0	0	
Total Southern Oceans		188	271	502	440	504	475	459	499	423	284	356	

a/ Split year fishing season: July 1 to June 30;
split-year data shown under the calendar year in which the split-year ends.
b/ Principally around South Georgia.
c/ Principally around Kerguelen.

Table 21
Tunas and other tuna-like species

Ocean	Species	Main fishing countries 1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation a/
Atlantic	Albacore	Spain, Other Asia, France	78	72	64	70	77	67	68	63	68	54	63	North: ? U-M South: ? F-O
	Bigeye	Japan, Spain, France,Portugal, Other Asia	51	53	66	62	60	49	57	69	65	68	71	? F-O
	N. Bluefin	France,Italy Spain, Japan	16	23	23	24	21	20	26	25	24	26	27	West: ? D East : ? F-O
	Skipjack	Spain, France, Ghana, Brasil	75	85	131	123	125	116	142	116	139	195	152	? M
	Yellowfin	Spain, France, Other Asia, Venezuela	86	124	143	141	137	136	130	155	175	159	151	F
	Billfishes, swordfish	Spain,Italy, Other Asia, Japan, USA	21	21	30	49	43	47	55	56	48	42	45	Blue & white marlin: F-O Sailfish, west: F-O Sailfish, east: U-M Swordfish, north: F Swordfish,south: ? F
Total principal tunas, billfishes and swordfish			327	378	457	469	463	435	478	484	519	544	509	
Small tunas and seerfishes		Turkey, Mexico Ghana, Senegal	89	87	127	114	97	119	132	118	117	110	89	
Total Atlantic Ocean			416	465	584	583	560	554	610	602	636	654	598	

Table 21 (continued)

Ocean	Species	Main fishing countries	1992	Catches ('000t) 1970 -74	1975 -79	1980 -84	1985 -89	1986	1987	1988	1989	1990	1991	1992	State of exploitation a/
Indian	Albacore	Other Asia		11	11	16	28	28	42	41	19	28	34	18	? F
	Bigeye	Other Asia,Japan, Korea Rep.		16	33	37	47	47	49	54	40	41	35	33	? F
	S. Bluefin b/	Japan, Australia		50	38	43	26	27	26	23	19	17	13	14	D
	Skipjack	Spain,Maldives, France, Japan.		38	34	63	180	149	169	205	238	217	218	268	U-M
	Yellowfin	France,Spain, Pakistan, Other Asia		30	38	55	136	118	129	180	154	171	163	219	? F
	Billfishes, swordfish	Sri Lanka,Korea Rep., India,Japan Japan		6	7	10	18	18	19	18	17	13	15	17	Swordfish: ? U
Total principal tunas, billfishes and swordfish				151	161	224	435	387	434	521	487	487	478	569	
Small tunas and seerfishes		India,Sri Lanka, Pakistan, UAE, Yemen, Iran		56	86	141	250	221	262	279	279	282	309	326	
Total Indian Ocean				207	247	365	685	608	696	800	766	769	787	895	

Table 21 (continued)

Ocean	Species	Main fishing countries	Catches ('000t) 1992	1970-74	1975-79	1980-84	1985-89	1986	1987	1988	1989	1990	1991	1992	State of exploitation a/
Pacific	Albacore	Other Asia, Japan, USA, Fiji		121	118	107	121	108	111	116	163	134	80	133	North: O, R South: F
	Bigeye	Japan, Korea Rep.		83	126	112	135	150	151	121	128	166	145	145	M-F
	N. Bluefin	Japan, USA		19	19	19	11	14	12	7	9	6	6	7	Y/R overfishing
	Skipjack	Japan,USA, Philippines, Indonesia		393	561	660	807	816	756	935	868	946	1148	1001	M
	Yellowfin	Mexico,Japan, Indonesia,Korea Rep.		301	388	397	575	543	601	602	655	712	670	722	East: F Center & west: M
	Billfishes, swordfish	Japan,Other Asia		59	60	62	69	66	73	76	76	83	80	80	Swordfish: M
Total principal tunas, billfishes and swordfish				976	1272	1357	1718	1697	1704	1857	1899	2047	2129	2088	
Small tunas and seerfishes		Indonesia,Philippines Japan,Thailand,Korea R.		342	369	531	715	641	692	798	818	919	884	814	
Total Pacific Ocean				1318	1641	1888	2433	2338	2396	2655	2717	2966	3013	2902	
Total all oceans principal tunas, billfishes and swordfish				1454	1811	2038	2622	2547	2573	2856	2870	3053	3151	3166	
Total all oceans small tunas and seerfishes				487	542	799	1079	959	1073	1209 /	1215	1318	1303	1229	
Total all tunas and tuna-like fishes				1941	2353	2837	3701	3506	3646	4065	4085	4371	4454	4395	

a/ Refers to no specific FAO statistical area(s), but the entire stock.
b/ Includes S. bluefin caught in the Pacific and Atlantic.

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